SCIENCE PROJECT INFORMATION INDEX

1973 - 1983

EDITED BY
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INTRODUCTION

There is a yearly deluge of requests in public and school libraries for information on science projects. This index is one attempt towards making the outcome of these requests more satisfactory. Besides providing direction towards specific information, the index is also meant to serve as a general book of ideas for the student searching for an interesting project.

In preparing the index, emphasis has been placed on including items which are readily available. The three periodicals indexed are widely held. Approximately seventy per cent of the books indexed are in print at the time of compilation, and the thirty per cent not in print were readily available on interloan to a suburban metropolitan library. Almost all works indexed are American imprints. Items difficult to obtain were omitted.

Items included would, generally speaking, be useful to students from grade six through to the end of high school. Some material, however, lies outside these limits, judged on the basis of the average student level. I hope that these exceptional items will be useful to exceptional students. It was my aim to include items from a wide variety of sciences, and from both the (so-called) pure and applied areas. I hope that in the course of working through material in any of the included subjects, even in working out some of the very specific electronics projects, the students will increase their understanding of and interest in basic scientific principles.

The index consists of approximately 5,500 entries arranged under more than 1,000 subject headings. Primary subject heading authority was Library of Congress Subject Headings, 9th ed. (1980). Ninety-five per cent of the headings used were drawn from this source. Modifications or additions were made in the case of the remaining five per cent because of a need for greater specificity or because I felt another term was more appropriate in 1984. See references were inserted from accepted LC headings not used to unsanctioned headings which were appropriate for the subject. In a few cases, minor changes were made to LC headings (e.g., removal of hyphens between words in headings) because the words appeared awkward as written. Any spelling modifications were based on Webster's Third New International Dictionary, unabridged. If filing was affected by change in the heading, a see reference was entered from the LC-accepted form. To facilitate finding information, natural language terms were often inserted, with see references given, if necessary, to the actual headings used in the index.

Arrangement of the index is alphabetical by subject heading. Within subject headings, arrangement is, for cosmetic reasons only, more or less alphabetical by title (or by author if a whole book is entered as a single item). Alphabetical arrangement within subject headings is of no practical significance in finding information because first words are not, in general, instructive. Titles of items have frequently been expanded to provide the user with more information. See ABBREVIATIONS AND FORMS OF ENTRY section, immediately following, for an explanation of the method of entry of items in the index.

Three items, two 1972 imprints and one from 1968, lie beyond the time range given in the title. These items seemed to me to be important enough to include, but not sufficient in number to justify modifying the dates of coverage.

Finally, a compromise needed to be made between price and printing. My primary interest in this regard was to provide a book which was also within the affordable range for the smaller library with a squeezed budget, while not sacrificing too much on quality of production. To the purists, my apologies for no sewing or stitching or exquisite printing.

ABBREVIATIONS AND FORMS OF ENTRY

Indexed material has come from books and magazines for which full bibliographic information is given in the BOOKS AND MAGAZINES INDEXED section beginning on page 279.

Abbreviated forms for these books and magazines are used in the index. The following two sample entries, one for an item from a book and one from a magazine, will explain the reading of the index.

1) Telescope - how it works. In: Papallo, What Makes It Work, p. 113

is an index entry taken from a book.

"Telescope - how it works" is the title or expanded title of the item;
"In: Papallo, What Makes It Work, p. 113" indicates that the information on how a telescope works is in a book by Papallo, that the first words of the title or the complete title is What Makes It Work, and that the information is in this book on page 113.
Check the BOOKS AND MAGAZINES INDEXED section under "Papallo" for full book information.

2) Construction of an elbow finder telescope. Sci Am, June '75, pp. 112, 114

is an index entry for an article from a magazine.

"Construction of an elbow finder telescope" is the title or expanded title of the article;
"Sci Am, June '75, pp. 112, 114" indicates that the article is in Scientific American (see magazine abbreviations below), that it is in the June 1975 issue of the magazine, and that the information is on pages 112 and 114 of this issue.

The following magazine abbreviations have been used in the index:

Pop Elec	for	Popular Electronics
Sci Am	for	Scientific American
Sci Teach	for	Science Teacher

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AMINES

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Experiment to show the rate of ammonia diffusion through air. Sci Teach, Apr. '81, p. 24, and addition Oct. '81, pp. 22-23

How to precipitate aluminum hydroxide by adding household ammonia to a solution of alum. In: Morgan, First Chemistry Book, pp. 124-126

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ANIMAL INTELLIGENCE
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ARSENIC

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ASTRONOMY
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Build a precision seconds/minutes interval timer - digital readout provides accurate on or off timing to 99 seconds or 99 minutes for powering 117-volt equipment. Pop Elec, Apr. '74, pp. 47-50
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Versatile IC timer - from 10 microseconds to 1000 seconds, using one IC and four components. Pop Elec, July '73, pp. 98-99

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AUTOMOBILES

Audible car protection alarm backs up car warning lights or meters. Pop Elec, Aug. '78, pp. 64-65, and addition Oct. '78, p. 8

Auto tachometer using Zener diode and transistor. In: Friedman, 99 Practical, pp. 24-25

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Automobile project: alarm sounds if your headlights or parking lights are on when ignition is off. Pop Elec, Jan. '81, p. 67

Automobile project: simple low-cost charger keeps automotive-type battery in peak shape. Pop Elec, Jan. '81, pp. 66-67

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Build an automobile logic alarm. Pop Elec, Nov. '75, pp. 61+

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Build "cruisealert," a 55 mph speed-limit alarm. Pop Elec, Feb. '79, pp. 57-60, and comment July '79, p. 6

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Digital automotive tune-up meter. Pop Elec, May '82, pp. 37+, and corrections July '82, p. 6, and in Computers & Electronics, Nov. '82, p. 6

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Hot grass - bacteria working in grass clippings produce heat. In: Brown, 666 Science Tricks & Expts., pp. 109-111

Infection of a good apple with bacteria from a rotting one. In: Brown, 666 Science Tricks & Expts., p. 145

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Bet you can't make your fingers meet under a yardstick at any place but the center - unconscious coordination of body to maintain balance. In: Cobb, Bet You Can't, p. 107

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Defying gravity - balancing trick with hammer, ruler, string & table. In: Brown, 666 Science Tricks & Expts., p. 374

Fork balancing act. In: Herbert, Mr. Wizard's, p. 77

Gravity trick using a leather belt. In: Brown, 666 Science Tricks & Expts., p. 94

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BEANS

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Kettlekamp, A Partnership of Mind and Body: Biofeedback -- describes kinds of experiments devised by scientists, and gives one experiment to do
Think warm - raising temperature of the hands by thinking them warmer (test using a thermometer). In: Brown, 666 Science Tricks & Expts., pp. 121-122
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Water droplets can be made to dance in a hot pan - steam holds them up briefly. In: Brown, 666 Science Tricks & Expts., pp. 283-284

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Do all liquids boil at the same temperature? In: Nelson, Science, p.7

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Making a warm air balloon using a plastic dry cleaning bag and a vacuum cleaner. In: Stein, Science Book, p. 164

Making an underwater color fountain. In: Goldstein-Jackson, Experiments, pp. 56-57

Making mothballs rise and fall in a glass. In: Goldstein-Jackson, Experiments, pp. 120-121

Moving a glass of water without touching it. In: Goldstein-Jackson, Experiments, pp. 48-49

Rising and sinking spaghetti, employing baking soda and vinegar - variation on the rising and sinking mothball demonstration. In: Herbert, Mr. Wizard's, p. 14

Showing why icebergs float. In: Goldstein-Jackson, Experiments, pp. 46-47

Submarine - how does it work. In: Papallo, What Makes It Work, pp. 84-85

Teaching an old (Cartesian) diver new tricks. Sci Teach, Oct. '82, pp. 25-27

Telling bad from fresh eggs without breaking them. In: Goldstein-Jackson, Experiments, pp. 42-43

Two demonstrations involving buoyancy: water and weight mystery, and demonstration with a cardboard square in water. In: Brown, 666 Science Tricks & Expts., pp. 160-161, 195-196

Unbalancing a see-saw without touching it. In: Goldstein-Jackson, Experiments, pp. 52-53

Unstable balls - naphthalene balls can be made to rise and sink in tubes. In: Cherrier, Fascinating...Chemistry, pp. 90-91

What causes objects to float or sink? In: Nelson, Science, p. 49

What happens to air when it is heated? In: Nelson, Science, p. 25

What is buoyancy? Demonstration with mothballs rising and sinking in water. In: Nelson, Science, p. 51

What makes a submarine go up and down? Demonstration with an eyedropper in a tumbler of water. In: Nelson, Science, p. 52

Why can we swim more easily in salt water? Demonstration with eggs in pure and salt water. In: Nelson, Science, p. 50

Why do ships float? Experiments with a test tube "ship". Sci Teach, May '76, p. 49

A working model submarine. In: Richards, Science Magic, p. 14

BURGLAR ALARMS
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Build a motion-detector alarm. Pop Elec, May '80, pp. 61-69
Burglar alarm. In: Mendelson, 103 Simple, p. 57
Burglar alarm circuits. Pop Elec, July '78, pp. 75-76
Burglar alarm systems. In: Clarke, Encyclopedia of How It Works, pp. 33-35
Electric eye alarm - when light is interrupted warning alarm sounds. In: Mendelson, 103 Simple, p. 112
Electronic siren. Pop Elec, Dec. '73, p. 58, and addition Mar. '74, p. 9
Electronic siren and intrusion alarm, using transistors. In: Malcolm, How to Build Electronic Projects, pp. 97-99
Electronic siren, using a transistor. In: Friedman, 99 Practical, pp. 29-30
Infrared intrusion system. Pop Elec, Dec. '78, pp. 66-69, and correction Jan. '79, p. 8
Latching burglar alarm. In: Friedman, 99 Practical, pp. 31-32
Low-cost apartment burglar alarm. Pop Elec, July '76, pp. 50-51, 56, and addition Mar. '77, p. 6
New, effective anti-burglary system. Pop Elec, June '82, pp. 49-54, and corrections Oct. '82, p. 9 and Mar. '83, p. 7
Photonic door and window intrusion alarm. Computers & Electronics, Feb. '83, p. 118
Portable battery-operated alarm for single entries. Pop Elec, Dec. '78, pp. 69-70
Simple burglar alarm circuit. Pop Elec, Apr. '82, p. 88
Solid state security - various alarm circuits. Pop Elec, Sept. '78, pp. 87-88, 90-91
Three-way tone generator from a code practice oscillator. In: Friedman, 99 Practical, pp. 56-57

BUTTER
How do we make butter? In: Nelson, Science, p. 311
Making butter from heavy cream. In: Morgan, First Chemistry Book, pp. 98-99

BUTTERFLIES
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Butterflies and moths, as pets in a jar. In: Simon, Pets, pp. 73-77, 90-91
Cardboard box cage for butterflies and moths. In: Roberts, You Can, pp. 15-17
How can we preserve insects or make a butterfly collection? In: Nelson, Science, pp. 275-276
How do caterpillars change to butterflies, or how do larvae change into moths? Very general suggestions for a classroom project. In: Nelson, Science, p. 259
Milk carton cage for butterflies and moths. In: Roberts, You Can, pp. 18-19
Monarch butterfly. In: Headstrom, Your Insect Pet, pp. 87-90, 144
Monarch butterfly - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 233-237
Mourning cloak and tortoise shells - classification, life cycles, how to find, what you can observe. In: Stokes, Guide, pp. 61-66
Plastic drinking glass cage for butterflies and moths. In: Roberts, You Can, pp. 9-14

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BUTTERFLIES (continued)
Some kinds of butterflies - Fritillary, Swallowtail, Monarch, Mourning Cloak, California Dog Face (Flying Pansy); brief descriptions and some useful information on raising them. In: Roberts, You Can, pp.22-29
Viceroy butterfly - classification, life cycle, how to find the larva in winter, what you can observe. In: Stokes, Guide, pp. 315-320
White and sulphur butterflies - classification, life cycles, how to find, what you can observe. In: Stokes, Guide, pp. 55-60
Wire screen cage for butterflies and moths. In: Roberts, You Can, pp. 20-21

BUZZERS
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CB RADIO
See RADIO - TRANSMITTERS AND TRANSMISSION

CABBAGE
Coloring liquids red, violet or green with the same dye - using red cabbage to make an acid/base indicator. In: Goldstein-Jackson, Experiments, pp. 122-123
Colour magic - beetroot or red cabbage acid/base indicator. In: Tuey, How to Be, pp. 14-15
Cooked red cabbage juice as acid/base indicator, and beet juice used as a base indicator; also using blackberry jam/jelly solution as an indicator. In: Brown, 666 Science Tricks & Expts., p. 335
Liquid chameleon - chemistry demonstration involving color changes and using red cabbage indicator, vinegar and ammonia. In: Cherrier, Fascinating...Chemistry, p. 80
Red cabbage chemical indicator to test for acids and bases. In: Herbert, Mr. Wizard's, p. 87
Spectacular acid and base test - indicator from red cabbage. In: Penrose, Dr. Zed's Brilliant, pp. 14-15
You can prepare an indicator from cabbage; the red cabbage juice is changed to green by a base. In: Morgan, First Chemistry Book, pp. 120-121

CACTUS
Indoor gardening projects: cacti and other succulents; iceplant, Indian corncob. In: Millard, Plants for Kids, pp. 94-99

CADDIS FLIES
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CADMIUM
Polarographic analysis - behavior of cadmium (II), polarogram of a mixture of two ions, and anodic and cathodic polarograms. In: Skoog, Fundamentals, pp. 759-760 and other pages referred to in experimental procedure

CAGES FOR ANIMALS
See ANIMAL CAGES

CALCIUM
Determination of calcium by oxalate precipitation followed by titration; includes procedures for analysis of calcium in impure calcium carbonate and determination of calcium in limestone. In: Skoog, Fundamentals, pp. 345-346 and 743-744
Determination of sodium, potassium, and calcium in mineral waters. In: Skoog, Fundamentals, p. 765 and chapter 25
Titration analysis based on chelate formation - preparation and standardization of EDTA solutions, and determination of calcium and magnesium (including calcium and magnesium in hard water) by this method. In: Skoog, Fundamentals, pp. 737-739 and chapter 13

CALCIUM CHLORIDE
Three simple stoichiometric experiments: determination of the atomic mass of an element (lithium), determination of the empirical formula of a compound (calcium chloride), and determination of the coefficients of an equation. Sci Teach, May '74, pp. 51-53

CALCIUM OXALATE
Chemical color reaction: "water" to "milk" and back again - precipitate resembling milk is calcium oxalate. In: Chen, Entertaining, pp. 13-14

CALCIUM SULPHATE
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CALCULATING MACHINES
See ABACUS; COMPUTERS; ELECTRONIC CALCULATING MACHINES; SLIDE RULE

CALCULATORS
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CALENDAR
Build a digital clock-calendar. Pop Elec, Nov. '73, pp. 29-34

CALORIMETERS AND CALORIMETRY
Determining the latent heat of a substance - experiment using ice; to measure the effect of incoming solar radiation on the rate of melting of ice. In: Norton, Solar Energy, pp. 16-19
Heat you can eat - laboratory exercise to determine the amount of heat produced by burning a peanut. Sci Teach, May '82, pp. 52-53
Measuring the heat content of wood. Sci Teach, Jan. '81, pp. 36-37
To measure the amount of heat energy used in a hot bath. In: Norton, Solar Energy, pp. 55-57

CAMERA OBSCURA
Cereal-box camera obscura. In: Herbert, Mr. Wizard's, pp. 10-11
Making a camera obscura incorporating a Fresnel lens. In: Wels, Science, pp. 71-72
Making a camera obscura using a Fresnel lens. In: Wels, Science, pp. 60-62

CAMERAS
See also CAMERA OBSCURA; PHOTOGRAPHY

Build all solid-state TV camera. Pop Elec, Feb. '75, pp. 27-31
Camera and projector. In: Clarke, Encyclopedia of How It Works, pp. 36-51

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CAMERAS (continued)

Camera - how it works. In: Papallo, What Makes It Work, p. 107
How can we make a pinhole camera? In: Nelson, Science, p. 89
How does a camera focus? Simple demonstration using light source, magnifying glass, and a white surface. In: Nelson, Science, p. 87
How does a camera work? In: Nelson, Science, p. 88
Make a simple camera. Sci Teach, Nov. '82, p. 55
Making a pinhole picture box. In: Tuey, How to Be, pp. 28-29
Pinhole camera. Sci Teach, Nov. '83, Science Scope supplement, pp. [10-11]
Pleasures of the pinhole camera and its relative the pinspeck camera. Sci Am, Nov. '81, pp. 192, 195-198, 200, 202, and a note on patent in Apr. '82 issue, p. 161
Shoebox camera. Sci Teach, Dec. '78, p. 44

CANDLES

Bet you can't make a candle flame pass through a strainer! - metal strainer absorbs heat energy of flame and temperature drops below kindling point. In: Cobb, Bet You Can't, p. 90
Blowing out a candle behind a bottle. In: Goldstein-Jackson, Experiments, pp. 14-15
Blowing out a candle through a funnel. In: Goldstein-Jackson, Experiments, pp. 16-17
Candle flame chemistry. In: Brown, 666 Science Tricks & Expts., p. 366
Candle-in-a-jar demonstration to show how oxygen is consumed by a flame: the traditional explanation of this experiment is incorrect. Sci Teach, Apr. '81, p. 23
Candle making. In: Clarke, Encyclopedia of How It's Made, pp. 23-26
Candle see-saw. In: Brown, 666 Science Tricks & Expts., p. 373
Comparing burning times of two candles, one covered by a jar containing air and one by a jar containing exhaled breath. In: Brown, 666 Science Tricks & Expts., pp. 331-332
Determining the percentage of oxygen in air using a candle and an inverted jar. In: Baldini, Student Science Activities, pp. 95-96 (but see "Candle-in-a-jar" item in this section as well)
Do fires need oxygen? Extinguishing a candle flame by covering the candle with a glass jar. In: Nelson, Science, p. 75
Fires require oxygen. Experiment with a candle in an inverted jar sitting in a pan of water. In: Morgan, First Chemistry Book, pp. 71-77
Home-made clocks: sundial, candle clock, sand clock. In: Richards, Science Magic, pp. 48-49
How does air move about a burning candle? In: Nelson, Science, p. 35
How to experiment with "weightlessness" - experiment with a burning candle. In: Greenleaf, Experiments in Space Science, p. 111
Lighting a candle without touching it - this demonstration shows the reignition of a just-extinguished candle by holding a lighted match near the wick. In: Goldstein-Jackson, Experiments, pp. 112-113
Making a candle (an oil lamp) without wax. In: Goldstein-Jackson, Experiments, pp. 128-129
Making a candle lift water. In: Goldstein-Jackson, Experiments, pp. 8-9
Making a hollow candle by burning a candle in a glass of water. In: Goldstein-Jackson, Experiments, pp. 126-127
Physics and chemistry of a candle flame; making and experimenting with different types of candles. Sci Am, Apr. '78, pp. 154-155, 157-160, 162, 164
Preparation of roman candles. In: Cherrier, Fascinating...Chemistry, pp. 59-60

CANDLES (continued)

When a candle burns; a candle is a miniature gas factory; the gas in a candle flame; the carbon and the water in a candle flame. In: Morgan, First Chemistry Book, pp. 75-80

Where is a candle flame the hottest? In: Nelson, Science, p. 71

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CAPACITORS AND CAPACITANCE

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Capillarity, or how water rises spontaneously in a narrow vessel. In: Cherrier, Fascinating...Physics, p. 31

Capillary tricks & tests. In: Richards, Science Magic, pp. 28-29

Experiments with capillarity. In: Lanners, Secrets, p. 113

Experiments with water involving capillary action. In: Richards, Science Magic, p. 28

Magic glasses - demonstration incorporating the principles of capillary action and buoyancy. In: Cherrier, Fascinating...Physics, pp. 26-27

Perpetual motion machine using principle of capillary action - does it work? In: Gardner, Moving Right Along, pp. 130-131

Various demonstrations of capillary action. In: Brown, 666 Science Tricks & Expts., pp. 155, 159, 165, 177-178, 184-185

Water into wine. In: Lanners, Secrets, pp. 53-54

CARBOHYDRATES

See also STARCH; SUGARS

How do we digest carbohydrates (starches and sugars)? In: Nelson, Science, p. 305

What foods contain carbohydrates (starches and sugars)? Tests with iodine solution and Benedict's solution. In: Nelson, Science, p. 304

CARBON

See also CHARCOAL; COAL

When a candle burns; a candle is a miniature gas factory; the gas in a candle flame; the carbon and the water in a candle flame. In: Morgan, First Chemistry Book, pp. 75-80

CARBON DIOXIDE

See also CARBONIC ACID

Add salt to a bottled carbonated beverage - carbon dioxide will be released and will make a coin on the mouth of the bottle move up and down. In: Brown, 666 Science Tricks & Expts., p. 366

CARBON DIOXIDE

CARBON DIOXIDE (continued)

Bet you can't keep a match burning over a glass of soda! - carbon dioxide extinguishes the flame. In: Cobb, Bet You Can't, pp. 86-87

Breath contains carbon dioxide - effect on limewater. In: Morgan, First Chemistry Book, pp. 136-137

Carbon dioxide extinguishes fire. In: Morgan, First Chemistry Book, pp. 133-134

Carbon dioxide fire extinguisher. In: Tuey, How to Be, pp. 34, 37

Carbon dioxide from fermentation, using yeast. In: Brown, 666 Science Tricks & Expts., pp. 339-340

Carbon dioxide - general discussion; making carbon dioxide from baking soda. In: Morgan, First Chemistry Book, pp. 129-133

Comparing burning times of two candles, one covered by a jar containing air and one by a jar containing exhaled breath. In: Brown, 666 Science Tricks & Expts., pp. 331-332

Constructing a closed system using a water plant such as elodea, water, and two or three pond snails - simulating a closed system in space travel. In: Simon, How to Be a Space Scientist, pp. 56-57

Demonstration of carbon dioxide absorption by plants. In: Baldini, Student Science Activities, pp. 141-142

Demonstration that germinating seeds give off carbon dioxide gas. In: Baldini, Secret Science Activities, pp. 158-159

Demonstrations involving carbon dioxide production: making a "soda fountain" and a soda fire-fighter. In: Herbert, Mr. Wizard's, pp. 18-19

Do plants in darkness give off carbon dioxide? In: Nelson, Science, p. 235

Dry ice; making a bushel of bubbles with dry ice in soapy water; fighting fire with carbon dioxide (here dry ice is used). In: Morgan, First Chemistry Book, pp. 139-143

Experiments with oxygen: a test for oxygen (glowing splinter); when carbon burns in oxygen, carbon dioxide is formed. In: Morgan, Adventures in Electrochemistry, pp. 211-215

Gas cannon operating with carbon dioxide gas. In: Amery, KnowHow... Experiments, p. 5

How carbon dioxide reacts to burning materials. In: Baldini, Student Science Activities, pp. 99-100

How do we detect carbon dioxide? Demonstration using limewater or slaked lime. In: Nelson, Science, p. 18

How does a fire extinguisher work? Carbon dioxide generation using vinegar and baking soda. In: Nelson, Science, p. 15

How liquid carbon dioxide and dry chemical fire extinguishers work. In: Papallo, What Makes It Work, p. 118

How to make a carbon dioxide rocket using carbon dioxide cartridges. In: Baldini, Student Science Activities, pp. 74-75

How to make a fire extinguisher using sodium bicarbonate, and aluminum sulphate or tartaric acid. In: Cherrier, Fascinating... Chemistry, p. 89

How to make a mini-pill bottle soda-acid carbon dioxide fire extinguisher. In: Baldini, Student Science Activities, pp. 101-103

How to make carbon dioxide. In: Baldini, Student Science Activities, p.99

How to make limewater and how to use it to detect carbon dioxide. In: Baldini, Student Science Activities, pp. 100-101

Is carbon dioxide heavier than air? In: Nelson, Science, p. 76

Making a carbon dioxide fire extinguisher. In: Penrose, Dr. Zed's Brilliant, pp. 48-49

Making a fire extinguisher using vinegar and baking soda. In: Goldstein-Jackson, Experiments, pp. 124-125

CARBON DIOXIDE (continued)

Making limewater from calcium hydroxide or calcium oxide, and testing the effect of carbon dioxide on it. In: Simon, How to Be a Space Scientist, pp. 53-54

Making mothballs rise and fall in a glass. In: Goldstein-Jackson, Experiments, pp. 120-121

Micro test for carbon dioxide using barium hydroxide. Sci Teach, Sept. '79, p. 49

A "pop" bottle - carbon dioxide pressure causes cork to blow out. In: Brown, 666 Science Tricks & Expts., p. 338

Quench the fire - baking soda on a grease fire releases carbon dioxide. In: Brown, 666 Science Tricks & Expts., p. 314

Red liquid (phenolphthalein solution) which your breath will turn clear. In: Morgan, First Chemistry Book, pp. 138-139

Testing exhaled air. In: Baldini, Student Science Activities, p. 128

Testing for carbon dioxide in the air from a burning candle and from the lungs. In: Simon, Projects, pp. 53-55

There is carbon dioxide in the atmosphere - effect on limewater. In: Morgan, First Chemistry Book, pp. 137-138

Vinegar rocket launcher, based on build-up of carbon dioxide pressure. In: Herbert, Mr. Wizard's, p. 28

Will carbon dioxide gas support combustion? In: Nelson, Science, p. 77

Yeast produces carbon dioxide, which will turn limewater milky. In: Brown, 666 Science Tricks & Expts., pp. 146-147

CARBON DISULPHIDE

Cold flame, produced by igniting mixture of carbon tetrachloride and carbon disulfide in a certain ratio. In: Chen, Entertaining, p. 53

CARBON TETRACHLORIDE

Cold flame, produced by igniting mixture of carbon tetrachloride and carbon disulfide in a certain ratio. In: Chen, Entertaining, p. 53

CARBONATED BEVERAGES

Add salt to a bottled carbonated beverage - carbon dioxide will be released and will make a coin on the mouth of the bottle move up and down. In: Brown, 666 Science Tricks & Expts., p. 366

Reflections on the rising bubbles in a bottle of beer. Sci Am, Dec. '81, pp. 172-174, 176, 186, and correction and addition Oct. '82, pp. 190, 192

CARBONATES

See also SODIUM CARBONATE

Analysis by titration of carbonate and carbonate mixtures. In: Skoog, Fundamentals, pp. 247-249 and 733-734

Determination of calcium by oxalate precipitation followed by titration; includes procedures for analysis of calcium in impure calcium carbonate and determination of calcium in limestone. In: Skoog, Fundamentals, pp. 345-346 and 743-744

Potentiometric titration of a carbonate-bicarbonate mixture. In: Skoog, Fundamentals, pp. 753-755

Water of hydration - a volumetric approach; analyzing hydrates of carbonates. Sci Teach, Apr. '83, p. 56

CARBONIC ACID

Red liquid (phenolphthalein solution) which your breath will turn clear. In: Morgan, First Chemistry Book, pp. 138-139

CARRAGEENIN

CARRAGEENIN
Chocolate pudding: carrageenan stabilization. In: Cobb, More Science Experiments, pp. 75-77

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How do roots absorb water? Demonstration of osmosis using a carrot. In: Nelson, Science, p. 217
Indoor gardening project: grow carrot "ferns". In: Millard, Plants for Kids, pp. 12-13, 17

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CASEIN
Casein glue from milk. In: Herbert, Mr. Wizard's, p. 36
Felt hats, buttons and umbrella handles from milk - the extraction of casein from milk. In: Morgan, First Chemistry Book, pp. 99-101

CATALYSIS
Activated catalyst complex demonstration - catalyst cobalt chloride speeds reaction of rochelle salt and hydrogen peroxide. Sci Teach, Jan. '74, p. 44, and comment May '76, p. 48
Making a sugar cube burn using ashes. In Shalit, Science, pp. 38-39
Preparation of oxygen from hydrogen peroxide, and the effect of manganese dioxide as a catalyst. Sci Teach, Sept. '73, p. 52
Sugar that flames - sugar cube burns when ash catalyst added. In: Cherrier, Fascinating...Chemistry, p. 70

CATERPILLARS
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How do caterpillars change to butterflies or how do larvae change into moths? Very general suggestions for a classroom project. In: Nelson, Science, p. 259
Tent caterpillar - classification, how to find, what you can observe, and the life cycle. In: Stokes, Guide, pp. 67-73
Woolly bear (tiger moth caterpillar) - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 238-242

CATHODE RAY OSCILLOGRAPH
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CATHODE RAY TUBES
Cathode-ray demonstrator. In: Giant Handbook, pp. 64-68
Cathode ray tube. In: Clarke, Encyclopedia of How It Works, pp. 56-58
Cathode ray tube - how it works. In: Papallo, What Makes It Work, pp. 63-65

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Examining your cells with a microscope. In: Baldini, Student Science Activities, pp. 112-113
Jello cell model. Sci Teach, Jan. '78, pp. 35-36

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CENTER OF MASS
Center of gravity - experiments with falling pencils. In: Brown, 666 Science Tricks & Expts., p. 9
Finding the center of Africa. In: Goldstein-Jackson, Experiments, pp. 146-147
Gravity: do heavier things fall faster; which falls faster, a dropped object or a horizontally propelled one; how can the center of gravity cause stability. In: Nelson, Science, pp. 168-170
Magic pegboard and weighted string - determining of center of gravity. In: Shalit, Science, pp. 84-86
Uphill roll trick using yardsticks and paper cups - center of gravity moves down. In: Brown, 666 Science Tricks & Expts., pp. 398-399
Various tricks and other activities involving center of gravity considerations. In: Cobb, Bet You Can't, pp. 13-23

CENTRIFUGAL FORCE
Constructing a simple spin drier. In: Amery, KnowHow...Experiments, p.31
How can we create zero gravity by using centrifugal force? Demonstration involving swinging a pail containing water. In: Nelson, Science, p. 204
How do earth satellites stay up? A simple demonstration of the balancing of centrifugal force and gravity using rubber bands and ping pong balls. In: Nelson, Science, p. 200
How to gain weight in space: simple spinning bucket experiment demonstrates centrifugal force and relates it to space flight activities. In: Simon, How to Be a Space Scientist, pp. 36-37
Lifting a marble without touching it. In: Goldstein-Jackson, Experiments, pp. 84-85
Lifting an apple without touching it. In: Goldstein-Jackson, Experiments, pp. 92-93
A lifting spinner. In: Richards, Science Magic, p. 10
Rising ball - keeping ball in an inverted jar by moving the jar. In: Brown, 666 Science Tricks & Expts., pp. 84-85
Some simple demonstrations involving gravity and centrifugal force. In: Brown, 666 Science Tricks & Expts., pp. 197-201
Water flows uphill. In: Richards, Science Magic, p. 11
What is the relationship between centrifugal force and gravity? In: Nelson, Science, p. 203

CENTRIFUGES
Bicycle centrifuge. In: Gardner, Moving Right Along, pp. 74-75

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CENTRIPETAL FORCE
An inward force. In: Gardner, Moving Right Along, pp. 69-74

CERAMIC MAGNETS
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CERIUM
Potentiometric titration of iron(II) with quadrivalent cerium. In: Skoog, Fundamentals, pp. 753, 756, chapter 17, and other pages referred to in the experimental procedure
Preparation and standardization of cerium(IV) solutions for quantitative chemical analysis. In: Skoog, Fundamentals, pp. 346-349 and 744-745

CHAMELEONS
Chameleons: changing our perceptions. Sci Teach, Apr. '76, p. 35

CHARCOAL
Apparatus that will allow the pyrogenation of wood (sawdust) to give seven products, including charcoal. In: Cherrier, Fascinating... Chemistry, pp. 84-85
Distilled wood. In: Brown, 666 Science Tricks & Expts., p. 364
How wood charcoal is made; the destructive distillation of wood. In: Morgan, First Chemistry Book, pp. 80-84

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CHEESE
Cottage cheese: whole versus skim milk. In: Cobb, More Science Experiments, pp. 27-33
Hard-ripened cheese. In: Cobb, More Science Experiments, pp. 33-37
Mold-ripened cheese. In: Cobb, More Science Experiments, pp. 37-43

CHELATES
Titration analysis based on chelate formation - preparation and standardization of EDTA solutions, and determination of calcium and magnesium (including calcium and magnesium in hard water) by this method. In: Skoog, Fundamentals, pp. 737-739 and chapter 13

CHEMICAL APPARATUS
See, e.g., ALCOHOL LAMP; BUNSEN BURNER; CENTRIFUGES; DISTILLATION APPARATUS; GLASS BLOWING AND WORKING; LANGMUIR TROUGH; SCALES (WEIGHING INSTRUMENTS)

CHEMICAL COMPOUNDS
See also names of specific compounds, e.g., SODIUM CHLORIDE, and of groups of compounds, e.g., POTASSIUM COMPOUNDS

Geometric forms in chemistry. Sci Teach, Sept. '81, pp. 26-31
How do we get elements from their compounds? Demonstration with mercuric oxide. In: Nelson, Science, p. 12
How to break a compound into elements - demonstration using mercuric oxide. In: Baldini, Student Science Activities, pp. 105-107

CHEMICAL COMPOUNDS (continued)

How to make a compound, demonstrating principles that mixing does not necessarily to chemical combination and that heating can lead to compound formation - reaction of iron and sulfur. In: Baldini, Student Science Activities, pp. 104-105

Product labels - ingredients for chemistry study; project involving collecting and examining the labels listing ingredients in various manufactured products. Sci Teach, Dec. '81, pp. 28-30

CHEMICAL ELEMENTS

See also ATOMIC MASS; CHEMICAL COMPOUNDS; names of specific chemical elements, e.g., BORON, CARBON

Electric quiz board of chemical elements and their symbols. In: Baldini, Student Science Activities, pp. 22-23, 90

Element blocks (paper cubes with written information on chemical elements). In: Baldini, Student Science Activities, pp. 91-93

How do we get elements from their compounds? Demonstration with mercuric oxide. In: Nelson, Science, p. 12

How to break a compound into elements - demonstration using mercuric oxide. In: Baldini, Student Science Activities, pp. 105-107

Making and using the atomic slide rule. In: Baldini, Student Science Activities, pp. 86-89

CHEMICAL EQUILIBRIUM

Chemical equilibrium demonstration using cobalt ions; demonstrates Le Chatelier's principle. Sci Teach, Jan. '77, p. 41

Equilibrium in solution - temperature effects using cobalt and copper ions. Sci Teach, Nov. '82, p. 55

CHEMICAL INDICATORS

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CHEMICAL REACTIONS

See also, e.g., COMBUSTION; EXPLOSIONS AND EXPLOSIVES; NEUTRALIZATION (CHEMISTRY); OXIDATION-REDUCTION REACTION; PHOTOCHEMISTRY; PRECIPITATION (CHEMISTRY); REDUCTION, CHEMICAL; STOICHIOMETRY; names of specific reactants or products of chemical reactions, e.g., CARBON DIOXIDE, HYDROGEN

"Barking dogs" chemical reaction (spontaneous combustion), using white phosphorus. In: Chen, Entertaining, p. 65

Changing "water" into "wine" into "cider" - a chemical color demonstration using potassium permanganate and oxygenated water. In: Cherrier, Fascinating...Chemistry, p. 80

Chemical clock reaction gives spectacular color changes. Sci Teach, Sept. '76, p. 44

Chemical color reaction: a color-indicating-time reaction - ferric chloride and sodium thiosulfate solutions. In: Chen, Entertaining, pp. 33-34

Chemical color reaction: clock reaction based on formation of colloidal sulfur. In: Chen, Entertaining, pp. 34-35

Chemical color reaction: clock reaction involving iodine and iron tartrate. In: Chen, Entertaining, pp. 31-33

Chemical color reaction: formaldehyde clock reaction. In: Chen, Entertaining, pp. 28-30

Chemical color reaction: formation of colloidal arsenic trisulfide (orange color). In: Chen, Entertaining, pp. 30-31

CHEMICAL REACTIONS

CHEMICAL REACTIONS (continued)

Chemical color reaction: iodine clock reaction - deep blue starch-iodine complex formed. In: Chen, Entertaining, pp. 25-27

Chemical color reaction: old Nassau reaction (Hallowe'en colors) - colorless to bright orange to blue-black reaction series. In: Chen, Entertaining, pp. 27-28

Chemical color reaction: reversible color change accompanying temperature change, using cobalt chloride solution. In: Chen, Entertaining, pp. 36-37

Chemical color reaction: reversible color change accompanying temperature change, using iodine-starch solution. In: Chen, Entertaining, p. 37

Chemical color reaction: six different colors from the same bottle. In: Chen, Entertaining, pp. 16-17

Chemical color reaction: "water" to "milk" and back again - precipitate resembling milk is calcium oxalate. In: Chen, Entertaining, pp. 13-14

Chemical color reaction: "water" to orange and back again - mercuric chloride and potassium iodide form orange mercuric iodide. In: Chen, Entertaining, p. 13

Chemical color reactions: making colorful flags, coloring pictures, with a variety of chemicals. In: Chen, Entertaining, pp. 20-24

Chemical routes to mathematical concepts - chemical experiments used in determining cos 30°, $\sqrt{2}$, $\sqrt{3}$, and π. Sci Teach, Apr. '75, pp. 43-44

Chemical systems that oscillate between one color and another. Sci Am, July '78, pp. 152-156, 158-160, 162, and corrections Dec. '78, pp. 188, 190

Colorful chemical formula variations. In: Chen, Entertaining, pp. 17-19

Combustion of chemicals, started by liquids - concentrated sulfuric acid, concentrated nitric acid, hydrogen peroxide, glycerol and turpentine can be used on specific chemicals. In: Chen, Entertaining, p. 51

Combustion started by water, using several different mixtures of chemicals. In: Chen, Entertaining, pp. 49-50

Fire on water - pea-sized piece of potassium or sodium on water will produce hydrogen which ignites from heat of reaction. In: Chen, Entertaining, p. 50

Fire under water, using potassium chlorate, white phosphorus and concentrated sulfuric acid. In: Chen, Entertaining, pp. 50-51

Fire without matches using potassium permanganate and glycerine. In: Cherrier, Fascinating...Chemistry, pp. 72-73

Home experiments for high school chemistry - simple experiments on reaction rate and temperature, reaction rate and catalysts, reaction rate and concentration, and heats of reaction. Sci Teach, Oct. '73, pp. 45-46

How do materials combine? Demonstration using sulphur powder and iron filings. In: Nelson, Science, p. 13

How to make a compound, demonstrating principles that mixing does not lead necessarily to chemical combination and that heating can lead to compound formation - reaction of iron and sulfur. In: Baldini, Student Science Activities, pp. 104-105

A jug of color - chemical color reactions. Sci Teach, Sept. '80, p. 44

"Magic" powder that swells up and turns black - a chemical reaction involving cobalt chloride, sulphur and sugar. In: Cherrier, Fascinating... Chemistry, p. 61

Red, white, and blue - a trick involving three simple chemical reactions, using ammonia, copper sulfate, phenolphthalein, and magnesium sulfate. In: Shalit, Science, pp. 44-45

CHEMICAL REACTIONS (continued)
Stoichiometry and chemical equations - experiment with manganese and hydrochloric acid to demonstrate the molar ratio in a chemical reaction. Sci Teach, May '76, p. 48
What is meant by a chemical change? Demonstration involves heating sugar over a flame or other heat source. In: Nelson, Science, p. 11

CHEMICAL REDUCTION
See REDUCTION, CHEMICAL

CHEMICAL TESTS AND REAGENTS
See CHEMICALS; INDICATORS AND TEST PAPERS; names of specific chemicals being tested for, e.g., CARBON DIOXIDE, and specific reagents, e.g., LIME, and specific types of analysis, e.g., CHROMATOGRAPHIC ANALYSIS, FLAME TESTING

CHEMICALS
See also names of specific chemicals, e.g., SODIUM BICARBONATE, and groups of chemicals, e.g., CARBONATES, IRON COMPOUNDS

Chemical disposal for a high school chemistry laboratory. Sci Teach, Jan. '73, pp. 30-32, and comments and corrections Apr. '73, p. 6
Safe storage of chemicals: a checklist for teachers. Sci Teach, Feb. '81, pp. 16-21
Where to find, how to make, and how to use a few simple chemical ingredients. In: Shalit, Science, pp. 113-119
Where to obtain some common chemical supplies, and some tips on experimenting. In: Cherrier, Fascinating...Chemistry, p. 15

CHEMILUMINESCENCE
See also FLUORESCENCE

Chemiluminescence experiment based on alkaline oxidation of luminol. In: Chen, Entertaining, pp. 59-62

CHEMISTRY
See also headings beginning with CHEMICAL; ELECTROCHEMISTRY; PHOTOCHEMISTRY; STEREOCHEMISTRY; SURFACE CHEMISTRY; and specific terminology in the field of chemistry, e.g., ATOMS, SOLUTION (CHEMISTRY), SULPHUR DIOXIDE

Over-the-counter chemistry - bringing aspirin, antacids, and detergent to class; some of the ideas here could be used for chemistry projects. Sci Teach, Nov. '82, pp. 45, 47-48

CHEMISTRY - EXPERIMENTS
American Chemical Society, A Chemistry Project from Start to Finish
Home experiments for high school chemistry - simple experiments on reaction rate and temperature, reaction rate and catalysts, reaction rate and concentration, and heats of reaction. Sci Teach, Oct. '73, pp. 45-46
Three simple stoichiometric experiments: determination of the atomic mass of an element (lithium), determination of the empirical formula of a compound (calcium chloride), and determination of the coefficients of an equation. Sci Teach, May '74, pp. 51-53

CHEMISTRY - MODELS
See MOLECULES - MODELS

CHEMISTRY, ANALYTIC

CHEMISTRY, ANALYTIC
See also, e.g., CHROMATOGRAPHIC ANALYSIS; COLORIMETRY; INDICATORS AND TEST PAPERS; POLAROGRAPH AND POLAROGRAPHY; SEPARATION (TECHNOLOGY); SPECTROPHOTOMETRY

CHEMISTRY, ANALYTIC - QUALITATIVE
Diffusion of mercury through lead by siphoning using lead came, and using the lead came containing mercury to demonstrate qualitative analysis for lead and mercury. In: Chen, Entertaining, pp. 87-89
Qualitative analysis of ions. Sci Teach, Oct. '76, pp. 45-47

CHEMISTRY, ANALYTIC - QUANTITATIVE
See also, e.g., COULOMETRY (CHEMISTRY); GRAVIMETRIC ANALYSIS (CHEMISTRY); POTENTIOMETRY (CHEMISTRY); VOLUMETRIC ANALYSIS (CHEMISTRY); and other specific chemical analytical methods

Heavy metal analysis - heavy metal concentration in a soil sample. Sci Teach, May '76, p. 49

CHEMISTRY, PHYSICAL AND THEORETICAL
Stoichiometry and chemical equations - experiment with manganese and hydrochloric acid to demonstrate the molar ratio in a chemical reaction. Sci Teach, May '76, p. 48

CHEMISTRY OF SURFACES
See SURFACE CHEMISTRY

CHERRY
A cherry close up. Drawings of cross-sections of a cherry blossom and various other stages of development through to the ripe cherry. In: Stein, Science Book, pp. 88-89

CHESS
Build a computer-vs.-you chess game. Pop Elec, Dec. '78, pp. 49-51, 56-58

CHLORIDES
See also HALIDES; IODIDES; names of specific chlorides, e.g., COBALT CHLORIDE, LEAD CHLORIDE, SODIUM CHLORIDE

Determination of chloride in a soluble sample (gravimetric analysis). In: Skoog, Fundamentals, pp. 718-719
Potentiometric titration of a chloride-iodide mixture. In: Skoog, Fundamentals, pp. 411 and 753+ , and other pages as referred to in the experimental procedure
Volumetric determination of chloride by the Fajans method. In: Skoog, Fundamentals, p. 728
Volumetric determination of chloride by the Mohr method. In: Skoog, Fundamentals, pp. 179 and 726
Volumetric determination of chloride by the Volhard method. In: Skoog, Fundamentals, pp. 180 and 727-728

CHLORINE
See also BROMINE; HALOGENS; IODINE

Bleaching with chlorine - simple demonstration of the destruction of a dye in cloth by treating with Clorox. In: Morgan, First Chemistry Book, p. 155

CHLORINE (continued)
Chlorine breaks up water molecules and liberates oxygen; oxidizing action of sodium hypochlorite solution speeded up by small amount of vinegar (acid). In: Morgan, First Chemistry Book, pp. 153-154
How to make chlorine. Sci Teach, May '83, p. 67
Spontaneous combustion - antimony powder into a bottle of chlorine gas. In: Chen, Entertaining, p. 47
Spontaneous combustion - chlorine and acetylene. In: Chen, Entertaining, pp. 47-48
Voltameter apparatus produces chlorine and hydrogen from sodium chloride solution and can be constructed to make explosive soap bubbles. In: Cherrier, Fascinating...Chemistry, pp. 86-87

CHLOROPHYLL
Chlorophyll needed by green leaves for making starch - how to show presence of starch in leaves. In: Baldini, Student Science Activities, pp. 144-146

CHROMATES
Preparation and standardization of dichromate solutions for titration analysis. In: Skoog, Fundamentals, pp. 349-350 and 746

CHROMATOGRAPHIC ANALYSIS
See also PAPER CHROMATOGRAPHY

Identifying food dyes by chromatography. Sci Teach, Nov. '79, pp. 37-39
Thin-layer chromatography: a convenient way of separating things that are very much alike. Sci Am, Feb. '76, pp. 128-133, 140

CHROMIUM
Recovering chromium from old razor blades. Sci Teach, Dec. '75, p. 31

CICADA
Cicadas - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 131-137

CIPHERS
See CODES

CIRCLE
Finding the center of a circle. In: Goldstein-Jackson, Experiments, pp. 148-149
Magic envelope - drawing the diameter of a circle and finding the center of a circle. In: Shalit, Science, pp. 30-31

CIRCUIT BREAKERS (ELECTRICITY)
See ELECTRIC FUSES

CIRCUITS, ELECTRIC
See ELECTRIC CIRCUITS

CIRCUITS, ELECTRONIC
See ELECTRONIC CIRCUITS

CITIZENS' BAND RADIO
See RADIO - TRANSMITTERS AND TRANSMISSION

CITRUS FRUITS

CITRUS FRUITS
See also LEMON

Indoor gardening project: citrus orchard. In: Millard, Plants for Kids, pp. 31-32

CLAIRVOYANCE
See EXTRASENSORY PERCEPTION

CLARINET
See MUSICAL INSTRUMENTS

CLIMATE
See METEOROLOGY

CLOCKS AND WATCHES
See also AUTOMATIC TIMERS; SUNDIALS

Add a "tick-tock" to a digital clock. Pop Elec, Nov. '78, pp. 81-82
Adding features to electronic digital clocks - making a clock "fail-safe" (automatic power supply and timer), adding alarm functions. Pop Elec, Dec. '73, pp. 59-62
Beep...add a power-failure sensor to any ac digital clock. Computers & Electronics, Sept. '83, p. 79
Build a digital clock-calendar. Pop Elec, Nov. '73, pp. 29-34
Build a low-cost digital clock. Pop Elec, Mar. '73, pp. 51-55
Build a miniature digital stopwatch. Pop Elec, Dec. '76, pp. 57-59
Build your own electronic digital wristwatch. Pop Elec, Jan. '74, pp. 29-33
Clock. In: Clarke, Encyclopedia of How It Works, pp. 60-64
Digital clock and thermometer projects use sun or artificial light to recharge batteries. Pop Elec, Dec. '77, pp. 41-47
Digital clock circuit. Pop Elec, Jan. '74, p. 101
Digital electronic "Westminster" clock. Pop Elec, Nov. '76, pp. 57-59, and corrections June '77, p. 6 and Aug. '77, p. 6, and addition Oct. '77, p. 12
Digital stopclock for short and long event timing. Pop Elec, Jan. '76, pp. 48-52
Digital stopwatch. Pop Elec, Jan. '80, p. 93
8-track electronic timer simplifies recording. Pop Elec, July '79, pp. 57-63
Electronic stopwatch. Pop Elec, Mar. '74, pp. 85-87
Home-made clocks: sundial, candle clock, sand clock. In: Richards, Science Magic, pp. 48-49
How to make a sand jar clock. In: Baldini, Student Science Activities, p. 50
How to make a sky clock and tell time by consulting the Big Dipper. In: Greenleaf, Experiments in Space Science, pp. 27-33
How to make a test-tube sand clock. In: Baldini, Student Science Activities, pp. 51-52
Make your digital clock "fail-safe" - automatic power supply and automatic timer. Pop Elec, Dec. '73, pp. 59-60, and correction Feb. '74, p. 8
Simple stopwatch splits seconds. Pop Elec, Aug. '76, pp. 73+, and addition Sept. '77, p. 96

CLOCKS AND WATCHES (continued)

Six-digit crystal-controlled LED clock for vehicles. Pop Elec, Oct. '76, pp. 41-42, and correction Jan. '77, p. 8

Time/date wristwatch. Pop Elec, Mar. '75, pp. 36-41

Unique digital clock. Pop Elec, May '73, pp. 31-33, and addition Sept. '73, p. 9

Venerable clock is made highly accurate by equipping it with quartz-crystal works. Sci Am, Sept. '74, pp. 192-198, 212, and correction Nov. '74, p. 134

Watch. In: Clarke, Encyclopedia of How It Works, pp. 234-237

With a simple circuit teach your digital clock to control appliances. Pop Elec, May '82, pp. 73-74, 80

CLONING

Everything's coming up violets: cloning in the classroom. Sci Teach, Oct. '78, pp. 43-44

CLOUD CHAMBER

Detection of submicroscopic particles in a sample of air applying the principle of the Wilson Cloud Chamber; how to make an inexpensive demonstration or observation chamber. In: Schaefer, A Field Guide, pp. 293-296

CLOUDS

Diffusion cold chamber - method of construction & experimentation. In: Schaefer, A Field Guide, pp. 285-287

Directional homemade antenna for picking up images of cloud cover as photographed by weather satellites. Sci Am, Dec. '75, pp. 122-125,148

Formation of clouds in a water cloud box. In: Schaefer, A Field Guide, pp. 300-302

Mixing cold chamber, made from a food freezer chest. Clouds can be formed and experimented on with this apparatus. In: Schaefer, A Field Guide, pp. 280-285

Using photography in the atmosphere, particularly the photographing of clouds, and a short discussion of lightning photography. In: Schaefer, A Field Guide, pp. 313-316

Where do clouds come from? Forming clouds in a glass jug. In: Nelson, Science, p. 180

COAL

Making coke from coal. In: Morgan, First Chemistry Book, pp. 86-89

COBALT CHLORIDE

Activated catalyst complex demonstration - catalyst cobalt chloride speeds reaction of rochelle salt and hydrogen peroxide. Sci Teach, Jan. '74, p. 44,and comment May '76, p. 48

Chemical color reaction: reversible color change accompanying temperature change using cobalt chloride solution. In: Chen, Entertaining, pp.36-37

"Magic" powder that swells up and turns black - a chemical reaction involving cobalt chloride, sulphur and sugar. In: Cherrier, Fascinating...Chemistry, p. 61

Making heat-sensitive paper using cobalt chloride - paper changes color on heating. In: Cherrier, Fascinating...Chemistry, p. 51

Sympathetic ink/humidity indicator (cobalt chloride solution). In: Chen, Entertaining, p. 20

Weather indicator - cardboard painted with cobalt chloride solution is different colors when wet and when dry. In: Cherrier, Fascinating... Chemistry, p. 51

COCKROACHES

COCKROACHES
The cockroach. In: Headstrom, Your Insect Pet, pp. 122-125, 147
Temperature-dependence of retention by cockroaches of a learned routine. Sci Am, Feb. '74, pp. 112-115, 124

CODES
See also MORSE CODE

Rolling-pin secret code system for sending secret messages. In: Herbert, Mr. Wizard's, p. 58

COFFEE
The acid which is in tea and coffee - detection with litmus paper. In: Morgan, First Chemistry Book, p. 107
Circulation patterns in liquids, including investigation of patterns in Middle Eastern coffee. Sci Am, May '83, pp. 164, 167-170
Coffee production. In: Clarke, Encyclopedia of How It's Made, pp. 56-59
Examining what happens in the brewing of Middle Eastern coffee. Sci Am, Apr. '83, pp. 132, 134-138
Tasteless coffee - demonstration of how important smell is in our perception of foods. In: Brown, 666 Science Tricks & Expts., pp. 118-119
Wonders of physics that can be found in a cup of coffee or tea - fluid dynamics, electrostatics, pitch of sound, cooling. Sci Am, Nov. '77, pp. 152, 154-158, 160, 164

COHESION
Bet you can't pull apart two wet glasses - forces of cohesion and adhesion. In: Cobb, Bet You Can't, p. 61
Various demonstrations of adhesion and cohesion. In: Brown, 666 Science Tricks & Expts., pp. 163, 171-173, 178-179
Why do particles of sand and mud stick together when they are wet? Sci Am, Jan. '82, pp. 174-180

COKE
Making coke from coal. In: Morgan, First Chemistry Book, pp. 86-89

COLA, SYNTHETIC
Synthetic cola. In: Cobb, More Science Experiments, pp. 100-102

COLD CHAMBER
See REFRIGERATION AND REFRIGERATING MACHINERY

COLLOIDS
See also CARRAGEENIN; EMULSIONS

Disappearing liquid and canned heat - gel formation from calcium acetate and ethyl alcohol. In: Chen, Entertaining, pp. 71-72
Gelatin and egg. In: Brown, 666 Science Tricks & Expts., p. 327
Light scattering by milk particles. Sci Teach, Oct. '82, p. 51
Measuring the concentration of colloidal solutions or the dirt content of water using laser light. In: Kallard, Exploring, pp. 85-87

COLOR
Apparatus using rotating lights to show the effect of combining colors. Sci Teach, Dec. '80, p. 38, and addition Jan. '83, p. 65
Are some colors warmer than others? In: Nelson, Science, p. 78
Changing "water" into "wine" into "cider" - a chemical color demonstration using potassium permanganate and oxygenated water. In: Cherrier, Fascinating...Chemistry, p. 80

COLOR (continued)

Chemical clock reaction gives spectacular color changes. Sci Teach, Sept. '76, p. 44

Chemical color reaction: a color-indicating-time reaction - ferric chloride and sodium thiosulfate solutions. In: Chen, Entertaining, pp. 33-34

Chemical color reaction: clock reaction based on the formation of colloidal sulfur. In: Chen, Entertaining, pp. 34-35

Chemical color reaction: clock reaction involving iodine and iron tartrate. In: Chen, Entertaining, pp. 31-33

Chemical color reaction: formaldehyde clock reaction. In: Chen, Entertaining, pp. 28-30

Chemical color reaction: formation of colloidal arsenic trisulfide (orange color). In: Chen, Entertaining, pp. 30-31

Chemical color reaction: iodine clock reaction - deep blue starch-iodine complex formed. In: Chen, Entertaining, pp. 25-27

Chemical color reaction: old Nassau reaction (Hallowe'en colors) - colorless to bright orange to blue-black reaction series. In: Chen, Entertaining, pp. 27-28

Chemical color reaction: reversible color change accompanying temperature change,using cobalt chloride solution. In: Chen, Entertaining, pp. 36-37

Chemical color reaction: reversible color change accompanying temperature change, using iodine-starch solution. In: Chen, Entertaining, p. 37

Chemical color reaction: reversing colors (red to blue and blue to red) - experiments with Congo red and a saturated litmus solution. In: Chen, Entertaining, pp. 14-15

Chemical color reaction: six different colors from the same bottle. In: Chen, Entertaining, pp. 16-17

Chemical color reaction: two blues make one red, two reds make one blue - litmus paper (or litmus solution) reactions. In: Chen, Entertaining, pp. 15-16

Chemical color reaction: "water" to "milk" and back again - precipitate resembling milk is calcium oxalate. In: Chen, Entertaining, pp. 13-14

Chemical color reaction: "water" to orange and back again - mercuric chloride and potassium iodide form orange mercuric iodide. In: Chen, Entertaining, p. 13

Chemical color reactions involving oxidation-reduction indicators - reactions using methylene blue, resazurin solution, indophenol, benzoin, indigo carmine and phenanthrenequinone in various demonstrations. In: Chen, Entertaining, pp. 37-43

Chemical color reactions: making colorful flags, coloring pictures, with a variety of chemicals. In: Chen, Entertaining, pp. 20-24

Chemical systems that oscillate between one color and another. Sci Am, July '78, pp. 152-156, 158-160, 162, and corrections Dec. '78, pp. 188, 190

Colored spinners - produce different colors by spinning. In: Richards, Science Magic, p. 34

Colored tops - constructing tops of several colors which, when spun, create different colors. In: Cherrier, Fascinating...Physics, p. 64

Colorful chemical formula variations. In: Chen, Entertaining, pp. 17-19

Coloring liquids red, violet or green with the same dye - using red cabbage to make an acid/base indicator. In: Goldstein-Jackson, Experiments, pp. 122-123

The colors of white light, or how to obtain white light with three colored lights. In: Cherrier, Fascinating...Physics, p. 63

Colour magic - beetroot or red cabbage acid/base indicator. In: Tuey, How to Be, pp. 14-15

COLOR

COLOR (continued)

Crystallizing paint is useful in creating psychedelic slides, color wheels, and other special effects accessories. In: Wels, Science, pp. 79-80

Disappearing colors - how to prepare a color wheel which, when spun, looks white. In: Amery, KnowHow...Experiments, p. 19

Experiments concerning stimuli giving rise to color vision. Sci Am, June '79, pp. 188-192, 194, 202

Experiments with color mixing using flashlights, colored cellophane and fruit. In: Richards, Science Magic, p. 35

How can we make different colors with paints? Discovering which combinations of paint colors yield other colors. In: Nelson, Science, p. 91

How do our eyes blend separate colors? How to prepare a color disc. In: Nelson, Science, p. 291

How do we see color? Simple demonstration with a shoe box and construction paper. In: Nelson, Science, p. 90

A jug of color - chemical color reactions. Sci Teach, Sept. '80, p. 44

Learning about the color white. Sci Teach, Apr. '81, p. 25

Liquid chameleon - chemistry demonstration involving color changes and using red cabbage indicator, vinegar and ammonia. In: Cherrier, Fascinating...Chemistry, p. 80

Magic illusion wheels that change color when you spin them. In: Penrose, Dr. Zed's Brilliant, pp. 22-23

Mixing colors to make white. In: Goldstein-Jackson, Experiments, pp. 132-133

MusicVision set - sound that you can see; this project uses a purchased music "motiondizer". In: Wels, Science, pp. 17-19

Polarized color, and making a Mylar polarizing color wheel. In: Wels, Science, pp. 14-16

Simulating spectral colors with a specially marked rotating disc. In: Lanners, Secrets, pp. 126-127

Six-inch polarizing spinner and stand can be used to show shapes in many colors. Project uses a projector, and many of the items are from purchased kits. In: Wels, Science, pp. 32-36

Some ideas on using a 35mm visual effects projector. In: Wels, Science, pp. 20-23

Using plastic and glass discs to make color wheels and polarizing spinners which can be rotated in front of a projector. In: Wels, Science, pp. 8-9

COLOR OF FLOWERS

Turning a red rose white by bleaching with sulphur dioxide. In: Goldstein-Jackson, Experiments, pp. 116-117

COLOR OF FOOD

Food coloring: natural versus artificial. Experiment to determine whether artificial coloring made from coal tar has been used in a food. In: Cobb, More Science Experiments, pp. 80-83

Identifying food dyes by chromatography. Sci Teach, Nov. '79, pp. 37-39

Vitamin C versus oxygen - vitamin C added to foods to interfere with color changes. Experiment to demonstrate this effect of the vitamin. In: Cobb, More Science Experiments, pp. 69-72

COLOR VISION

See VISION

COLORIMETRY
See also SPECTROPHOTOMETRY

Cheap colorimetry for science classes. Sci Teach, Feb. '74, pp. 40-42, 50

COMBUSTION
See also FIRE; FIREWORKS; FLAME

Bet you can't burn a hole in the bottom of a paper cup! - water in the cup conducts heat energy of the match away from the paper. In: Cobb, Bet You Can't, p. 91
Bet you can't make a candle flame pass through a strainer! - metal strainer absorbs heat energy of the flame and temperature drops below the kindling point. In: Cobb, Bet You Can't, p. 90
Boil water in a paper cup without burning the cup, but the cup will burn if it contains only dry salt. In: Brown, 666 Science Tricks & Expts., p. 288
Burn flour (in the form of fine flour dust). In: Brown, 666 Science Tricks & Expts., p. 337
Can a magnifying glass start a fire? In: Nelson, Science, p. 86
Candle-in-a-jar demonstration to show how oxygen is consumed by a flame: the traditional explanation of this experiment is incorrect. Sci Teach, Apr. '81, p. 23
Cold flame, produced by igniting a mixture of carbon tetrachloride and carbon disulfide in a certain ratio. In: Chen, Entertaining, p. 53
Combustible iron wire - burns in oxygen. In: Cherrier, Fascinating... Chemistry, p. 68
Combustion of chemicals, started by liquids - concentrated sulfuric acid, concentrated nitric acid, hydrogen peroxide, glycerol and turpentine can be used on specific chemicals. In: Chen, Entertaining, p. 51
Combustion started by water, using several different mixtures of chemical compounds. In: Chen, Entertaining, pp. 49-50
Do fires need oxygen? Extinguishing a candle flame by covering the candle with a glass jar. In: Nelson, Science, p. 75
Fire bows; can you start a fire fastest with an Indian fire bow? - experimenting with changing the bow, cord, stick, etc. In: Renner, How to Build, pp. 106-124
Fire on water - pea-sized piece of potassium or sodium on water will produce hydrogen, which ignites from the heat of reaction. In: Chen, Entertaining, p. 50
Fire under water, using potassium chlorate, white phosphorus and concentrated sulfuric acid. In: Chen, Entertaining, pp. 50-51
Fire writing and drawing, using potassium nitrate solution. In: Chen, Entertaining, p. 52
Fireproof cloth - cloth soaked in a mixture of rubbing alcohol and water remains unburned when the alcohol is ignited. In: Brown, 666 Science Tricks & Expts., pp. 286-287
Fireproof paper - difficulty in burning paper wrapped tightly around a glass or tightly rolled. In: Brown, 666 Science Tricks & Expts., pp. 287-288
Fires require oxygen. Experiment with a candle in an inverted jar sitting in a pan of water. In: Morgan, First Chemistry Book, pp. 71-77
How carbon dioxide reacts to burning materials. In: Baldini, Student Science Activities, pp. 99-100
How does air move about a burning candle? In: Nelson, Science, p. 35

COMBUSTION

COMBUSTION (continued)

Lighting a candle without touching it - this demonstration shows the reignition of a just-extinguished candle by holding a lighted match near the wick. In: Goldstein-Jackson, Experiments, pp. 112-113

Making a sugar cube burn using ashes. In: Shalit, Science, pp. 38-39

Oxygen is a fire-maker - making oxygen with hydrogen peroxide and manganese dioxide. In: Morgan, First Chemistry Book, pp. 73-75

Pharaoh's serpents, made from mercuric thiocyanate. In: Chen, Entertaining, p. 53

Sugar that flames - sugar cube burns when ash catalyst is added. In: Cherrier, Fascinating...Chemistry, p. 70

When a candle burns; a candle is a miniature gas factory; the gas in a candle flame; the carbon and the water in a candle flame. In: Morgan, First Chemistry Book, pp. 75-80

Will carbon dioxide gas support combustion? In: Nelson, Science, p. 77

COMBUSTION, SPONTANEOUS

"Barking dogs" chemical reaction (spontaneous combustion), using white phosphorus. In: Chen, Entertaining, p. 65

Fire without matches, using potassium permanganate and glycerine. In: Cherrier, Fascinating...Chemistry, pp. 72-73

Spontaneous combustion - antimony powder into a bottle of chlorine gas. In: Chen, Entertaining, p. 47

Spontaneous combustion - chlorine and acetylene. In: Chen, Entertaining, pp. 47-48

Spontaneous combustion - phosphine gas in air. In: Chen, Entertaining, p. 47

Spontaneous combustion - red phosphorus and bromine. In: Chen, Entertaining, p. 48

Spontaneous combustion - red phosphorus and potassium chlorate. In: Chen, Entertaining, p. 48

COMETS

How to capture a comet. In: Greenleaf, Experiments in Space Science, p.100

Observation of comets. In: Roth, Astronomy: A Handbook, pp. 393-408

Photographing variable stars, novae and comets. In: Mayall, Skyshooting, pp. 60-76

COMMUNICATION

See INTERCOMMUNICATION SYSTEMS and such communication devices as RADIO, TELEPHONE, and TELEVISION

COMPASS

See also MAGNETISM, TERRESTRIAL

Compass. In: Clarke, Encyclopedia of How It Works, pp. 65-66

Demonstrating magnetic lines of force with a compass. In: Graf, Safe and Simple, pp. 44-46

A different kind of compass. In: Graf, Safe and Simple, pp. 57-58

Homemade compass in a dish of water. In: Brown, 666 Science Tricks & Expts., p. 220

How a compass works. In: How Things Work, pp. 18-21

How can we make a compass? In: Nelson, Science, p. 116

How to make a floating compass with a sewing needle and cork. In: Baldini, Student Science Activities, pp. 31-32

How to read your compass. In: Graf, Safe and Simple, p. 41

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Improvised compass. In: Cherrier, Fascinating...Physics, p. 17
Magnetic compass. In: Richards, Science Magic, p. 40
Making a floating compass. In: Graf, Safe and Simple, pp. 55-57
Making a simple magnetic compass.In: Stanley, Easy to Make, pp. 5-8
Making a very simple compass. In: Amery, KnowHow...Magnets, p. 7
Razor-blade compass. In: Tuey, How to Be, pp. 50-53
Simple demonstration with two bar magnets, one freely suspended, demonstrates basic principles of the magnetometer and compass, and magnetic fields. In: Simon, How to Be a Space Scientist, pp. 59-60

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Students learn from garbage - studying compost heaps. Sci Teach, Feb. '77, pp. 27-29

COMPOUNDS, CHEMICAL
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COMPRESSED AIR
A bicycle pump and air compression - what is the effect on temperature of air compression and how is a pump constructed. In: Simon, Projects, pp. 32-33

COMPUTERS
See also ELECTRONIC CALCULATING MACHINES; MICROPROCESSORS; PROGRAMMING (ELECTRONIC COMPUTERS); and devices used with computers,e.g., ELECTRONIC KEYBOARD, LIGHT PENS

Altair 8800 minicomputer project, parts 1 and 2. Pop Elec, Jan. '75, pp. 33-38, and Feb. '75, pp. 56-58
Analog computer circuits, parts 1 and 2. Pop Elec, Jan. '79, pp. 81, 83-84, and Feb. '79, pp. 80-85
Build a CMOS game computer. Pop Elec, May '74, pp. 58-61
Build a computer music box peripheral. Pop Elec, Apr. '78, pp. 60-61, and addition July '79, p. 55
Build a computer-vs.-you chess game. Pop Elec, Dec. '78, pp. 49-51, 56-58
Build an intelligent computer terminal. Pop Elec, July '76, pp. 35-38
Build the TVT-6: low-cost direct video display - interface for your microcomputer. Pop Elec, July '77, pp. 47-52, and Aug. '77, pp. 49-55, and addition Dec. '77, p. 6
CMOS quad two-input NAND gate (4011B); AND gate circuit; connecting up OR and NOR gates. In: Duncan, Adventures, pp. 19-21
Cassette control system for computers. Pop Elec, Nov. '78, pp. 94-98, and correction Jan. '79, p. 8
Computer ROM unit. In: Giant Handbook, pp. 178-182
Computer trainer - circuit useful in demonstrating basic computer concepts. In: Giant Handbook, pp. 124-129, 132-133
Computers. In: Clarke, Encyclopedia of How It Works, pp. 67-70
Constructing a microcomputer. In: Giant Handbook, pp. 187, 189-212
Construction of a computer demonstrator - set up to show the basic principles of computer logic. In: Giant Handbook, pp. 90, 92-98
Controller for high voltage transients for microcomputers. In: Carr, 104 Weekend, pp. 221-222
Digital counter-binary number system demonstrator - an electronic circuit construction. In: Giant Handbook, pp. 140-144
Electronic circuitry for binary-decimal number demonstrator. In: Giant Handbook, pp. 145-154

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Experimenting with simple programmable read-only memories. Pop Elec, Nov. '77, pp. 77-79

"Explorer" 8085-based microcomputer - construction project. Pop Elec, Nov. '78, pp. 87-92

First Motorola/AMI '6800' MPU computer project. Pop Elec, Nov. '75, pp. 33-37

Flip-flop computer demonstrator. In: Giant Handbook, pp. 214-221

Four-bit binary counter circuit counts to 15 and total is shown as four binary digits. In: Duncan, Adventures, pp. 52-55

Hexadecimal keyboard encoder, and adding RAM. Pop Elec, Nov. '78, p. 113, and Dec. '78, p. 86

Hobbyist's modem. Pop Elec, Mar. '76, pp. 43-46, 49-50, and correction May '76, p. 6

How to add I/O ports to microcomputers. Pop Elec, Oct. '79, pp. 50, 52, 56-57

How to build a very low cost computer terminal. Pop Elec, Dec. '74, pp. 38-43

Learning 16-bit microcomputer technology; series of articles on Intel 8088 CPU-based computer, including plans to assemble and expand hardware compatible with IBM-PC personal computer. Computers & Electronics, Mar. '83, pp. 81+, Apr. '83, pp. 91+, May '83, pp. 78+, June '83, pp. 74+, July '83, pp. 82+, and correction July '83, p. 7, and Aug. '83, pp. 93+, and Sept. '83, pp. 72+

Low-cost experimenter's microcomputer (COSMAC Elf), parts 1-4. Pop Elec, Aug. '76, pp. 33+, Sept. '76, pp. 37-40, Mar. '77, pp. 63-67, and July '77, pp. 41+, and addition Oct. '76, p. 6, and correction Dec. '76, p. 8, and addition Aug. '77, p. 6, and see additional articles Feb. '78, pp. 65+ and Mar. '78, pp. 62-65 and correction July '78, p. 6, and comment Oct. '78, pp. 6, 8, and addition Mar. '79, p. 6

Low-cost fully professional ASCII keyboard and encoder you can build. Pop Elec, Apr. '74, pp. 27-31

Microelectronic flip-flops and NAND gates add up to a high-speed counter. Sci Am, May '73, pp. 108-113, 120

Multiple-character generation from your computer keyboard with a simple circuit. Computers & Electronics, Oct. '83, p. 66

Number systems for microcomputers: how binary, octal, and hexadecimal systems work in relation to your computer. Computers & Electronics, Dec. '83, pp. 47-53, 55

Simple circuits enabling small computers to perform a variety of external operations. Pop Elec, Sept. '79, pp. 80-81

Speech board makes anything talk - synthesizer as a stand-alone device or with virtually any computer. Computers & Electronics, Dec. '82, pp. 47-48, 55-62

Speech synthesizer you can build for use with an S-100 bus computer. Pop Elec, Sept. '82, pp. 20+, and Oct. '82, pp. 43+

Speechlab: hobbyist vocal interface for a computer. Pop Elec, May '77, pp. 43-50

Two computer video display units - circuitry for single-character display and single-line 16 character display. In: Giant Handbook, pp. 179-181, 183-189

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Approximating the radius of curvature of small concave mirrors using laser light. In: Kallard, Exploring, pp. 44-45

Crazy mirrors - reflections from surfaces of different shapes. In: Richards, Science Magic, p. 33

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Mortar and concrete. In: Brown, 666 Science Tricks & Expts., p. 367

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Condensing water vapor from the air on the sides of a cold jar. In: Simon, How to Be a Space Scientist, pp. 50-51
Double-boiler rain - demonstration of why it rains. In: Herbert, Mr. Wizard's, p. 63
Fogs and mists - simple condensation demonstrations. In: Tuey, How to Be, pp. 12-13
Various demonstrations of evaporation and condensation. In: Brown, 666 Science Tricks & Expts., pp. 153, 159-160, 162, 167-169, 188-190
What is condensation? In: Nelson, Science, p. 6
Where does rain come from? Demonstration using steam from a teakettle and a pan of icewater. In: Nelson, Science, p. 182
Why does it rain? A number of demonstrations of the process of condensation. In: Amery, KnowHow...Experiments, p. 29

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Build a low-cost capacitance meter. Pop Elec, Oct. '76, pp. 64-66, and addition Feb. '77, p. 6
Build an autoranging digital capacitance meter. Pop Elec, Feb. '78, pp. 48-49, 52-54
Build the reactance measuring set - measures inductance and capacitance. Pop Elec, Mar. '81, pp. 67-71, 76-78
Capacitance measurement circuit. Pop Elec, Aug. '78, pp. 72-74
Capacitance substitution box and its use. In: Giant Handbook, pp. 413-416
Digital capacitance meter - digital display from 100pF to 1000μF. Pop Elec, Apr. '77, pp. 50-52, and correction Sept. '77, p. 6
Direct-reading capacitance meter measures from 15pF to 10μF in five ranges, plus options to 100μF. Pop Elec, Feb. '73, pp. 65-68
Experiment which demonstrates the formation of a film of aluminum oxide and its insulating quality on an aluminum anode. Formation of the film is used in building electrolytic capacitors. In: Morgan, Adventures in Electrochemistry, pp. 225-231
Fundamentals of capacitors, capacitor types, etc. Pop Elec, Oct. '76, pp. 94-95, 100-104
High-value electrolytic capacitor meter checks capacitance from 10 to 100,000 microfarads and indicates leakage. Pop Elec, June '74, pp. 45-47
Measuring the breakdown voltage of insulation and capacitor dielectric materials, and building a tester. In: Giant Handbook, pp. 471-482
Single-IC capacitance meter. Pop Elec, Feb. '74, pp. 44-45, and comments July '74, p. 9

CONDUCTION OF HEAT
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CONDUCTIVITY OF ELECTROLYTES
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Amperometric titrations: titration of arsenic(III) with bromate using a rotating platinum electrode. In: Skoog, Fundamentals, p. 761 and chapter 21 and other pages as indicated in procedure
Amperometric titrations: titration of lead and titration of sulfate ion, using dropping mercury electrode. In: Skoog, Fundamentals, pp. 760-761 and chapter 21
Amperometric titrations: titration with twin-polarized electrodes. In: Skoog, Fundamentals, p. 761

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'Chemical' confections made in the chemistry lab. Sci Teach, Dec. '76, p. 40, and comments May '77, p. 68
Large sugar crystals called rock candy can be made in kitchen laboratory. In: Morgan, First Chemistry Book, pp. 41-44
Light from the teeth - electrical discharge can be seen in a dark room when a wintergreen Life Saver candy is crushed. In: Brown, 666 Science Tricks & Expts., pp. 91-92
Observing triboluminescence in hard candy and other substances and studying the spectrum produced. Sci Am, July '82, pp. 146-147, 150-151, 154

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Laser beam generates conic sections. In: Kallard, Exploring, p. 63

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Constellation board displaying 17 constellations to scale - uses light bulbs to represent stars. Sci Teach, Feb. '76, p. 36
How to make a sky clock and tell time by consulting the Big Dipper. In: Greenleaf, Experiments in Space Science, pp. 27-33

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Crazy mirrors - reflections from surfaces of different shapes. In: Richards, Science Magic, p. 33
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Looking with lenses - several demonstrations. In: Richards, Science Magic, p. 38

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How to make "space bread" from algae flour. In: Greenleaf, Experiments in Space Science, p. 113
How to make worm cookies step-by-step; using worms as food, and how worms and other insects measure up as sources of protein. In: Taylor, Kids' Whole Future Catalog, p. 75
Physics and chemistry of a failed sauce bearnaise. Sci Am, Dec. '79, pp. 144-145, 147-150, 162
Physics and chemistry of the lemon meringue pie. Sci Am, June '81, pp. 194, 196-198, 200, 202
Taylor, Entertaining with Insects - information on how to make food dishes using insects, where to buy insects and how to collect and raise them on one's own

COOLING OF SOLUTIONS
Wonders of physics that can be found in a cup of coffee or tea - fluid dynamics, electrostatics, pitch of sound, cooling. Sci Am, Nov. '77, pp. 152, 154-158, 160, 164

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Chemical trick involving removing copper tarnish with ketchup. In: Shalit, Science, pp. 45-47
Clean copper or brass. In: Brown, 666 Science Tricks & Expts., p. 314
Copper-plating a piece of paper. In: Morgan, Adventures in Electrochemistry, pp. 243-244
Cupric ion is blue - electroplating of copper from a copper sulfate solution. In: Morgan, Adventures in Electrochemistry, pp. 220-221
Electrogravimetric analysis: determination of copper in an aqueous solution, and separation and determination of copper and nickel in alloys. In: Skoog, Fundamentals, pp. 756-758
Electroplating a carbon rod with copper. In: Morgan, Adventures in Electrochemistry, pp. 242-243
Electroplating of nickel and of copper. In: Giant Handbook, pp. 266-269
How to electroplate copper and nickel on leaves. Sci Teach, Oct. '74, pp. 42-45
Immersion plating - copper sulfate solution and a screwdriver. In: Morgan, Adventures in Electrochemistry, pp. 140-141
Immersion plating experiment (zinc sheet and copper sulfate solution), and an explanation in electrochemical terms. In: Morgan, Adventures in Electrochemistry, pp. 141-144
Iodometric method to quantitatively determine copper in ore and brass. In: Skoog, Fundamentals, pp. 366-369 and 749-751
Magic green flames from boric acid and from copper. In: Shalit, Science, pp. 48-49

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Making a silver tree with copper wire and a silver nitrate solution. In: Chen, Entertaining, p. 81
Salt and vinegar on copper. In: Brown, 666 Science Tricks & Expts., p. 334
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Forming chunks of synthetic mineral by the crystallization of copper sulphate. In: Cherrier, Fascinating...Chemistry, p. 27
Growing giant crystals of copper sulphate. In: Cherrier, Fascinating... Chemistry, p. 23
Red, white, and blue - a trick involving three simple chemical reactions, using ammonia, copper sulfate, phenolphthalein, and magnesium sulfate. In: Shalit, Science, pp. 44-45
Testing for water impurity in alcohol using anhydrous copper sulfate: demonstration related to the importance of the purity of rocket fuels. In: Simon, How to Be a Space Scientist, pp. 16-17

COPYING PROCESSES
Copying a newspaper picture using a water/turpentine/soap mixture. In: Goldstein-Jackson, Experiments, pp. 136-137
Duplicating. In: Clarke, Encyclopedia of How It Works, pp. 82-84
Picture transfer using a turpentine/detergent solution. In: Brown, 666 Science Tricks & Expts., pp. 88-89
Xerography. In: Clarke, Encyclopedia of How It's Made, pp. 195-198

CORN
Growing corn from seed, including fertilizing the corn. In: Stein, Science Book, pp. 104-108

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Cathodic protection - corrosion demonstrations with a number of metals, including zinc, tin and iron. In: Brown, 666 Science Tricks & Expts., pp. 358-360

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Fast cotton - does cotton or polyester fiber absorb water more quickly? A cotton cloth and a permanent-press cloth? In: Brown, 666 Science Tricks & Expts., pp. 281-282

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Coulometric analysis: titration of trivalent arsenic with iodine. In: Skoog, Fundamentals, pp. 758-759 and other pages referred to in the experimental description

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Observation and dissection of a cow's eye. In: Baldini, Student Science Activities, pp. 129-130

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Experiment with the biological time clock of the fiddler crab. In: Simon, Secret Clocks, pp. 58-59
Hermit crabs, as pets in a jar. In: Simon, Pets, pp. 82-85, 90-91

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Chemistry and curds - curdling will likely result from boiling tomatoes with milk or cream; soda will neutralize acid from tomatoes. In: Brown, 666 Science Tricks & Expts., p. 324
Cultured cream - studying the effect of two starter cultures on heavy cream. In: Cobb, More Science Experiments, pp. 23-27

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Cricket thermometer. In: Brown, 666 Science Tricks & Expts., p. 109
Crickets and grasshoppers - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 200-208
Crickets as pets in a jar. In: Simon, Pets, pp. 64-67, 90-91
The field cricket. In: Headstrom, Your Insect Pet, pp. 37-42, 141
How to construct a cricket cage and care for your pet crickets. In: Roberts, You can, pp. 31-39
Tree crickets - classification, life cycle, how to find eggs, and what you can observe. In: Stokes, Guide, pp. 289-293

CROSS-STAFF
Build-it-yourself astronomy: making and using the cross staff and the quadrant. Sci Teach, Mar. '83, pp. 48-51
Cross-staff, primitive equivalent of the sextant - construction and use for latitude and astronomical measurements. Sci Am, Nov. '74, pp. 126-127, 134, 146
Measuring with a cross-staff. Sci Teach, Sept. '79, pp. 44-45

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Experiments with various salts - copper sulfate, washing soda, sodium chloride, calcium chloride, plaster of Paris - to determine behavior in relation to water: is water lost in heating or on exposure to air, is water absorbed by exposed salts? In: Rosenfeld, Science, pp. 117-120, 122-123, 125, 170
Plaster of Paris sets when its water of crystallization returns. In: Morgan, First Chemistry Book, pp. 49-52

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Water is a part of some crystal structures - experiment using washing soda to demonstrate water of hydration; also discussion of plaster of Paris. In: Morgan, First Chemistry Book, pp. 46-50

Water of hydration - a simplification. Sci Teach, Sept. '81, p. 53

Water of hydration - a volumetric approach; analyzing hydrates of carbonates. Sci Teach, Apr. '83, p. 56

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Arborescent crystallization of copper sulphate or potassium ferricyanide on a glass plate. In: Cherrier, Fascinating...Chemistry, p. 20

Convenient and elegant method for growing large well-formed salt crystals. Sci Teach, Feb. '77, p. 39

Crystal columns (stalactites and stalagmites) from washing soda. In: Amery, KnowHow...Experiments, p. 9

Crystal gardens. In: Tuey, How to Be, pp. 16-21

Crystal growing and cutting. Sci Teach, Jan. '74, pp. 41-43

Crystallization is useful to chemists as a means of separating substances - demonstrated with a sand/salt experiment. In: Morgan, First Chemistry Book, pp. 45-46

Crystallization of a variety of substances to form decorations of various sorts. In: Cherrier, Fascinating...Chemistry, pp. 32-43

Crystallizing magnesium sulphate and forming miniature stalactites and stalagmites from magnesium sulphate. In: Cherrier, Fascinating... Chemistry, p. 19

Crystals and their patterns - observing, through crossed polaroid filters, the patterns formed by salts from evaporated solutions. Sci Teach, Feb. '83, p. 54

Crystals from photographer's hypo (sodium thiosulphate) solution. In: Brown, 666 Science Tricks & Expts., p. 357

Crystals on a thread. In: Lanners, Secrets, pp. 96-98

Dynamic model of a crystal lattice using small magnets. Sci Teach, Feb. '75, p. 63

Form supersaturated photographer's hypo (sodium thiosulphate) solution, then induce crystallization to form beautiful pattern. In: Brown, 666 Science Tricks & Expts., p. 358

Forming a "diamond merchant's chest" of crystals of alum. In: Cherrier, Fascinating...Chemistry, p. 26

Forming chunks of synthetic mineral by the crystallization of copper sulphate. In: Cherrier, Fascinating...Chemistry, p. 27

Forming crystals on photographic film and projecting them. In: Cherrier, Fascinating...Chemistry, p. 20

Grow a salt garden. In: Brown, 666 Science Tricks & Expts., p. 333

Grow alum crystals. In: Brown, 666 Science Tricks & Expts., pp. 351-352

Grow crystals from Epsom salts. In: Brown, 666 Science Tricks & Expts., p. 332

Grow your own crystals with salt, sugar or washing soda. In: Amery, KnowHow...Experiments, p. 8

Growing a sphere of potassium alum into an octahedron. In: Cherrier, Fascinating...Chemistry, p. 30

Growing crystals from a sugar solution. Sci Teach, May '82, p. 61

Growing crystals of sugar, salt, borax, etc., through evaporation. In: Herbert, Mr. Wizard's, p. 22

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Growing giant crystals of copper sulphate. In: Cherrier, Fascinating... Chemistry, p. 23

How are crystals formed? Method of forming alum crystals. In: Nelson, Science, p. 166

Large sugar crystals called rock candy can be made in a kitchen laboratory. In: Morgan, First Chemistry Book, pp. 41-44

Lot's wife: growing a pillar of sodium acetate from a supersaturated solution. Sci Teach, Apr. '82, p. 56

Making alum crystals. In: Morgan, First Chemistry Book, pp. 40-41

Making crystals of rock salt. In: Morgan, First Chemistry Book, pp.39-40

Making "precious stones" of various shapes and colors by crystallization of, e.g., potassium alum, chrome alum, potassium ferricyanide and magnesium sulphate. In: Cherrier, Fascinating...Chemistry, pp. 24-25

Making salt crystals. In: Morgan, First Chemistry Book, p. 38

Mothball frost - formation of mothball crystals on the inside of a jar. In: Herbert, Mr. Wizard's, p. 57

One crystal inside another, using potassium alum and chrome alum or nickel sulphate and magnesium sulphate. In: Cherrier, Fascinating... Chemistry, p. 29

Photomicrography of snow crystals. In: Schaefer, A Field Guide, pp. 297-300

Projecting crystal patterns in convergent laser light. In: Kallard, Exploring, pp. 99-100

Sugar crystals. In: Cherrier, Fascinating...Chemistry, p. 31

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Hypercubes. In: Gardner, Mathematical Carnival, pp. 41-54

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Caustics: mathematical curves generated by light shined through rippled plastic - formed when light reaches a surface by refraction or reflection. Sci Am, Sept. '83, pp. 190-191, 195-197, 199-202

Making a curve by drawing only straight lines. In: Goldstein-Jackson, Experiments, pp. 144-145

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Black-winged damselfly - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 120-125

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Electronic circuitry for binary-decimal number demonstrator. In: Giant Handbook, pp. 145-154
Cracking the numerical control code - electric device for learning binary-decimal code. In: Giant Handbook, pp. 210-211, 213-214

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Soap and detergents make water wetter. In: Morgan, First Chemistry Book, pp. 163-168

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Electronic dice. In: Duncan, Adventures, pp. 40-43
Have fun with electronic dice. Pop Elec, July '75, pp. 48-49

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Universal differentiator. In: Carr, 104 Weekend, pp. 42-47

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Diffraction of light by ultrasonic waves, using laser light. In: Kallard, Exploring, pp. 206-213
Measuring the diameter of a hair by diffraction using laser light. In: Kallard, Exploring, pp. 202-203
Simple optical experiments in which spatial filtering removes the "noise" from pictures; process using laser light is based on diffraction and interference of light waves. Sci Am, Nov. '82, pp. 194, 198, 198B, 199, 202-204, 204B-206
Variety of diffraction demonstrations using laser light. In: Kallard, Exploring, pp. 184-200

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Demonstration showing spectrum formation from candle or alcohol lamp light passing through a diffraction grating; color effect of adding some common salts (table salt, epsom salts, baking powder) to the flame. In: Simon, How to Be a Space Scientist, pp. 67-68

Electrically controllable diffraction grating, using a liquid crystal and laser light. In: Kallard, Exploring, pp. 204-205

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Diffusion in air and vacuum. Sci Teach, Oct. '82, p. 58

Diffusion of gases - a simple qualitative study. Sci Teach, Apr. '83, p. 56

Diffusion of mercury through lead by filtration. In: Chen, Entertaining, p. 87

Diffusion of mercury through lead by siphoning using lead came, and using the lead came containing mercury to demonstrate qualitative analysis for lead and mercury. In: Chen, Entertaining, pp. 87-89

Experiment to show the rate of ammonia diffusion through air. Sci Teach, Apr. '81, p. 24, and addition Oct. '81, pp. 22-23

Relative rates of diffusion of air and hydrogen. In: Chen, Entertaining, pp. 76-78

Rubber is porous: water vapor can diffuse through rubber. Sci Teach, Apr. '81, p. 25

Sinking colored ice cubes and diffusion. Sci Teach, Oct. '82, p. 50, and comment Jan. '83, p. 10

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How do we digest carbohydrates (starches and sugars)? In: Nelson, Science, p. 305

How saliva helps in the digestion of foods. In: Baldini, Student Science Activities, pp. 114-115

DINOSAURS

Some facts about 24 prehistoric reptiles and mammals, mainly dinosaurs. In: Wels, Science, pp. 67-69

Suggestions for a dinosaur land scene. In: Wels, Science, p. 70

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Diode projects. In: Traister, First Book, pp. 18-26

Experiments with a diode. In: Brown, 666 Science Tricks & Expts., pp.45-47

One-touch diode tester. Pop Elec, July '77, p. 75

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Experimenting with light emitting diodes, and some background information on LED's. Pop Elec, Oct. '74, pp. 58-61, 88-90, and Feb. '75, p. 77, and additions Mar. '75, pp. 78-79 and Oct. '75, pp. 89-90 and Jan. '76, pp. 80-81

Four easy-to-build LED projects - blinker, flasher, binary counter, and wheel of fortune. Pop Elec, Apr. '78, pp. 80-83

High-resolution LED display. Pop Elec, Mar. '79, pp. 94-95

How an LED works. Pop Elec, Apr. '78, p. 90

LED flasher circuit. Pop Elec, Nov. '76, p. 92

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LED flasher using integrated circuit gives basis for timing circuit. In: Malcolm, How to Build Electronic Projects, pp. 114-117
Light-emitting diodes (LED). In: Traister, First Book, pp. 54-55
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Echoes - sound wave demonstrations and experiments. In: Richards, Science Magic, p. 43

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Lunar eclipses, including information on the theory of lunar eclipses and on photography. In: Roth, Astronomy: A Handbook, pp. 289-312
What causes an eclipse? Demonstration of lunar and solar eclipses using a globe and tennis balls. In: Nelson, Science, p. 153

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How fresh the egg? - egg becomes more buoyant as it ages; also, spinning eggs to distinguish hard boiled from raw ones. In: Brown, 666 Science Tricks & Expts., p. 329
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Magic egg - floats on brine layer at bottom of glass, but sinks through plain water at top. In: Chen, Entertaining, pp. 86-87
Osmosis - a demonstration using an egg. Sci Teach, Sept. '77, p. 38
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Raw and hard-boiled eggs can be distinguished by spinning - fluid momentum causes difference. In: Herbert, Mr. Wizard's, p. 40
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Telling raw from hardboiled eggs without breaking the shells. In: Goldstein-Jackson, Experiments, pp. 80-81
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Elasticity - some simple demonstrations with a rubber balloon, a rubber band and strips of scrap glass. In: Brown, 666 Science Tricks & Expts., pp. 379-380

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Alarm control circuits with timers. Pop Elec, May '74, pp. 83-84
Alarm for toxic gases. Pop Elec, Sept. '81, pp. 79-80, and correction Feb. '82, p. 12
Appliance "off" reminder. Pop Elec, June '81, p. 76
Audible car protection alarm backs up car warning lights or meters. Pop Elec, Aug. '78, pp. 64-65, and addition Oct. '78, p. 8
Automobile project: alarm sounds if your headlights or parking lights are on with ignition off. Pop Elec, Jan. '81, p. 67
Beep...Add a power-failure sensor to any ac digital clock. Computers & Electronics, Sept. '83, p. 79
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Build an automobile logic alarm. Pop Elec, Nov. '75, pp. 61+
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Build the mailbox sentry: LED and tone indicators announce mail arrival at remote location. Computers & Electronics, Nov. '82, pp.76-77
Circuit flashes light at baby's cry. Pop Elec, Oct. '81, p. 98
Circuit for general-purpose alarm. Pop Elec, Oct. '79, pp. 87, 92
Circuit produces audible signal after short exposure to light. Pop Elec, Mar. '81, p. 92
Clogged-filter and system-trouble alarm for a home furnace. In: Fox, Unique Electronic, pp. 100-103
Clothespin alarms - set-up can be used to make a simple fire alarm or rain alarm. In: Herbert, Mr. Wizard's, p. 54
Early-warning car battery-drain indicator. Pop Elec, Dec. '81, pp. 69-72
Electric-eye annunciator using the 555 IC timer. Pop Elec, July '74,p. 51
Electronic audible turn signal for a car. Pop Elec, Mar. '82, p. 101
Electronic combination lock - alarm for car ignition system. In: Friedman, 99 Practical, pp. 33-34
Electronic device to determine when it begins to rain. Pop Elec, June '73, p. 94
Electronic power-failure alarm. Pop Elec, June '76, pp. 55-56, and correction Dec. '76, p. 8
Electronic pulsed bleeper. In: Duncan, Adventures, pp. 48-51

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Electronic siren and intrusion alarm, using transistors. In: Malcolm, How to Build Electronic Projects, pp. 97-99

Emergency broadcast system monitor monitors output of broadcast receiver and sounds necessary warning. Pop Elec, Dec. 80, pp. 62, 64-66

Event-failure alarm. Pop Elec, Apr. '82, p. 107

Flashing light - flashes about once per second. In: Mendelson, 103 Simple, p. 121

Flood alarm for basement, using transistor. In: Friedman, 99 Practical, pp. 30-31

Freezer over-temperature alarm. Pop Elec, Apr. '81, pp. 75-76

Gas/smoke detector - the Taguchi gas sensor. In: Fox, Unique Electronic, pp. 93-97

Headlight minder using transistor warns if headlights are left on. In: Friedman, 99 Practical, pp. 27-28

Headlight reminder - special alarm for cars and motorbikes. Pop Elec, Jan. '73, p. 86

Home-freezer thaw alarm; sounds alarm when freezer temperature rises above preset value. Pop Elec, May '74, p. 81

Improved gas and fume detector. Pop Elec, Aug. '76, pp. 46-47, and corrections Nov. '76, p. 6 and Jan. '77, pp. 6, 8

Infant alert. Pop Elec, July '76, p. 30

Light alarm. Pop Elec, Oct. '80, p. 84

Light minder for automobiles, negative ground - sounds alarm if car lights are left on when ignition is turned off. In: Mendelson, 103 Simple, p. 119

Light minder for automobiles, positive ground - sounds alarm if car lights are left on when ignition is turned off. In: Mendelson, 103 Simple, p. 120

Light-operated alarm using integrated circuit. In: Duncan, Adventures, pp. 36-39

Low-cost smoke and/or gas detector. In: Giant Handbook, pp. 344-345

Open-door "fridge alarm". Pop Elec, May '79, pp. 69-70

Piezoelectric speaker siren. Computers & Electronics, Dec. '83, pp. 89-92

Poisoned air detector - low-cost sensor sounds alarm with as little as 50ppm of most toxic gases. Pop Elec, Feb. '74, pp. 55-56

Power failure alarm. In: Friedman, 99 Practical, pp. 32-33

Power-off alarm. In: Brown, 666 Science Tricks & Expts., pp. 51-52

Protect property with a CMOS guardian - indicates whether unauthorized person has used electric machines. Pop Elec, Feb. '80, p. 96

Remote security communicator - how to send control and voice/music signals hundreds of feet away through a common ac power line. Computers & Electronics, Apr. '83, pp. 66-68, 70, 72, 74-75

Simple auto burglar alarm. In: Carr, 104 Weekend, pp. 162-165

Siren generator circuit. Pop Elec, Oct. '74, p. 90

Slave unit turns on emergency light over fuse box if fuse blows or circuit breaker opens and will signal general power failure. In: Giant Handbook, pp. 442-445

Solid-state level-sensing switch for sump pumps; also able to sound alert. Pop Elec, Aug. '79, pp. 31-33

Solid state security - various alarm circuits. Pop Elec, Sept. '78, pp. 87-88, 90-91

Theft alarm for handheld calculators. Pop Elec, Mar. '76, p. 42

Touch alarm circuit. Pop Elec, Mar. '74, p. 24, and correction June '74, p.24

Two simple automotive alarm circuits. Pop Elec, Jan. '73, p.32

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ELECTRIC ALARMS (continued)

Vehicle low-fuel indicator alarm. Pop Elec, Aug. '79, pp. 34-35, 40, and correction Jan. '80, p. 6

Warble alarm circuit using 555 IC timer chip. Pop Elec, Jan. '74, pp. 72-73

Warbling-wailing siren using integrated circuit. In: Duncan, Adventures, pp. 24-27

Water-leak detector - circuit senses presence of water and sounds alarm when probe resistance drops. Computers & Electronics, June '83, pp. 61-63

Water level alarm. In: Carr, 104 Weekend, pp. 149-153

"Whelper" alarm circuit. Pop Elec, Sept. '74, p. 93

ELECTRIC APPARATUS AND APPLIANCES

See also, e.g., headings beginning with ELECTRIC and ELECTRONIC; CONDENSERS (ELECTRICITY); ELECTROMAGNETS; ELECTROPHORUS; ELECTROSCOPE; OSCILLATORS, ELECTRIC; PHOTOELECTRIC DEVICES; TRANSDUCERS; and other related headings

Cracking the numerical control code - electric device for learning binary-decimal code. In: Giant Handbook, pp. 210-211, 213-214

Electric hot plate. In: Giant Handbook, pp. 340-341

Electric practice keyboard. In: Giant Handbook, pp. 359-361

Electrical appliance tester and its use. In: Giant Handbook, pp. 432-435

Fluorescent light blueprinter. In: Giant Handbook, pp. 335-337

Low-cost remote control of appliances and lights. Pop Elec, May '75, pp. 46-47

Making simple bulb holders and switches for electrical demonstrations. In: Amery, KnowHow...Magnets, pp. 12-13

Making simple electrical gadgets - a lighthouse, a lantern, a night light. In: Amery, KnowHow...Magnets, pp. 14-17

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See also ELECTRONIC APPARATUS AND APPLIANCES - TESTING

Appliance tester for small appliances. In: Friedman, 99 Practical, pp. 92-93

Electrical appliance tester and its use. In: Giant Handbook, pp. 432-435

Filament-continuity tester enables testing for open filaments of vacuum tubes, flashlight bulbs, indicator lamps, etc., and fuses of all kinds. In: Giant Handbook, pp. 438-440

Make a simple electric tester with a bulb and battery. In: Brown, 666 Science Tricks & Expts., p. 216

ELECTRIC BATTERIES

See also PHOTOELECTRIC CELLS; SOLAR BATTERIES

Auto battery charger/battery eliminator. In: Carr, 104 Weekend, pp.146-149

Battery, electric. In: Clarke, Encyclopedia of How It Works, pp. 19-20

Do-it-yourself batteries. Pop Elec, June '81, pp. 84-87

Electric battery (dry cell) - how it works. In: Papallo, What Makes It Work, pp. 136-137

Electricity from a lemon, using a nail and copper wire. In: Brown, 666 Science Tricks & Expts., p. 217

Experimental storage cell (using lead and a solution of sodium bisulfate) - construction, forming the plates, methods of charging. In: Morgan, Adventures in Electrochemistry, pp. 176-182

Homemade battery. Sci Teach, Apr. '78, p. 51

How batteries work. In: Chapman, Young Scientist, pp. 8-9

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How to make a voltaic pile. In: Morgan, Adventures in Electrochemistry, pp. 156-158

How to make a voltaic pile or battery. In: Baldini, Student Science Activities, pp. 45-46

The Leclanché cell and how to make a Leclanché-type cell. In: Morgan, Adventures in Electrochemistry, pp. 159-162

Make your own voltaic pile. In: Graf, Safe and Simple, pp. 77-78

Materials needed for simple electrical experiments and constructions; preparing wires, wiring batteries and bulb holders, etc. In: Amery, KnowHow...Magnets, pp. 10-11

Money power - producing an electric current using wet blotters, dimes and pennies, and detecting the current with a simple galvanometer. In: Brown, 666 Science Tricks & Expts., pp. 205-206

Potato power station. In: Richards, Science Magic, pp. 56-57

Recovery of manganese(II) sulfate from dead batteries. Sci Teach, Nov. '73, p. 45

Schematic diagrams and chemical equations demonstrating electric battery chemistry. In: Giant Handbook, pp. 79-84

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Auto battery charger/battery eliminator. In: Carr, 104 Weekend, pp.146-149

Auto battery trickle charger. In: Carr, 104 Weekend, pp. 161-162

Automobile project: simple low-cost charger keeps automotive-type battery in peak shape. Pop Elec, Jan. '81, pp. 66-67

Build a nickel-cadmium battery charger. Pop Elec, Oct. '74, pp. 68-69

Build a rechargeable flashlight. Pop Elec, Apr. '73, p. 62, and important error correction Sept. '73, pp. 8-9

Build an electronic battery charge monitor. Pop Elec, June '77, pp. 88-89, and comment Nov. '77, p. 12

Build the battery multi-charger. Pop Elec, Feb. '76, pp. 67-68

Chemical polarity indicator shows which wire is positive and which negative when connected to direct current source. In: Morgan, Adventures in Electrochemistry, p. 268

Digital clock and thermometer projects use sun or artificial light to recharge batteries. Pop Elec, Dec. '77, pp. 41-47

Easy battery tester. In: Brown, 666 Science Tricks & Expts., p. 219

Electronic diagnostic instrument for locating and identifying problems in battery or charging systems. Pop Elec, Jan. '79, pp. 62-64, and addition Aug. '80, p. 6

Electroplater and battery charger - output 0 to 14 volts dc at 1 amp. In: Mendelson, 103 Simple, p. 20

How can we determine which is the positive pole of a battery? Potato is used in this demonstration. In: Nelson, Science, p. 128

How to use solar energy to recharge your batteries. Pop Elec, Aug. '82, pp. 55-58

Inexpensive auto battery tester. Pop Elec, Nov. '80, pp. 78-80

Light-bulb charger for flashlight batteries. In: Friedman, 99 Practical, p. 99

Nickel-cadmium battery charger. In: Friedman, 99 Practical, pp.98-99

Potato polarity indicator for a battery. In: Graf, Safe and Simple, p.83

Recharging a dry cell. Pop Elec, June '74, p. 24

Sine-wave inverter boosts 12 volts dc to 117 volts ac at 100 watts and also recharges storage batteries. Pop Elec, June '76, pp. 43-46

Universal charger for sealed rechargeable batteries. Pop Elec, July '79, pp. 50-51, 53

ELECTRIC BELLS

ELECTRIC BELLS
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Bell, electric. In: Clarke, Encyclopedia of How It Works, pp. 23-24
Electronic bell. Pop Elec, Nov. '73, p. 50
Electronic door bell. Pop Elec, Nov. '74, p. 17
Electronic ringer for telephone lines. Pop Elec, May '81, pp. 70-73, and addition Aug. '81, p. 7
How does an electric doorbell work? In: Nelson, Science, p. 130
Siren - can be used as a doorbell. In: Mendelson, 103 Simple, p. 35
Three-tone electronic doorbell. Pop Elec, Apr. '82, p. 88
Two-tone door bell using integrated circuit. In: Duncan, Adventures, pp. 22-23
Variable tone doorbell. In: Carr, 104 Weekend, pp. 160-161

ELECTRIC BUZZER
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Electromagnetic buzzer. In: Brown, 666 Science Tricks & Expts., pp.53-54
Electronic touch buzzer. In: Giant Handbook, pp. 357-359
How to make a buzzer and a relay. In: Graf, Safe and Simple, pp. 112-115
Make an electric buzzer. In: Stanley, Easy to Make, pp. 49-55
Making an electric buzzer. In: Penrose, Dr. Zed's Dazzling, pp. 42-43

ELECTRIC CELL
See ELECTRIC BATTERIES

ELECTRIC CIRCUIT BREAKERS
See ELECTRIC FUSES

ELECTRIC CIRCUITS
See also ELECTRONIC CIRCUITS

Circuit layout for a demonstration of Ohm's Law. In: Giant Handbook, pp. 144-145
Circuits and switches - basic symbols used in electrical diagrams; and how to make an elementary switch with a paper clip. In: Chapman, Young Scientist, p. 32
Constructing a demonstrator board to present differences between series and parallel circuits. In: Giant Handbook, pp. 118-121
Dim the lamps - an electric circuit arrangement involving series and parallel connections. In: Brown, 666 Science Tricks & Expts., pp. 208-209
Electric circuit for measuring the ratio of the average and rms values of a $\sin \omega t$ function. Sci Teach, Dec. '83, p. 53
Electric mystery boxes clarify various current electricity concepts. Sci Teach, May '75, pp. 60-61
Electrifying journey - constructing a simple electric circuit using a 3-volt battery, a bulb and some wire. In: Tuey, How to Be, pp.58-63
Flashing robot with simple electrical circuit. In: Amery, KnowHow...Magnets, pp. 36-39
How to make an electric quiz board. In: Baldini, Student Science Activities, pp. 22-23
How to make an electrical circuitry card. In: Baldini, Student Science Activities, pp. 19-21

ELECTRIC CIRCUITS (continued)

How to supply electric power to something that is turning - patented device for making a direct electrical connection with flexible conductors between a fixed power source and a continuously rotating load. Sci Am, Dec. '75, pp. 120-123, 148

Light to current control - controlling heavy direct current by using a LASCR (light-activated silicon controlled rectifier). In: Friedman, 99 Practical, pp. 88-89

Materials needed for simple electrical experiments and constructions; preparing wires, wiring batteries and bulb holders, etc. In: Amery, KnowHow...Magnets, pp. 10-11

Morse code transmitters - key completes circuit on sending transmitter, bulb lights up on receiving box; also table of Morse codes for letters and numbers. In: Amery, KnowHow...Magnets, pp. 32-35

Pin ball game, involving electric circuits. In: Amery, KnowHow...Magnets, pp. 30-31

Resistor cube and its uses. In: Giant Handbook, pp. 136-142

Series and parallel circuits. In: Graf, Safe and Simple, pp. 107-109

Simple circuit with a small dc motor - motor lifts a weight when a button is pushed. Sci Teach, Sept. '73, p. 52, and additions Apr. '75, p. 45 and Mar. '76, pp. 37-38

Slave unit turns on emergency light over fuse box if fuse blows or circuit breaker opens, and will signal general power failure. In: Giant Handbook, pp. 442-445

Some simple electric circuits; wiring in series and in parallel; one- and two-way switches; a quiz box; a coordination tester. In: Stein, Science Book, pp. 228-236

Steady hand game, involving trying not to touch two wires to complete an electrical circuit. In: Amery, KnowHow...Magnets, pp. 24-25

Stop-go traffic lights. In: Amery, KnowHow...Magnets, pp. 28-29

Track the invisible wires - game involving completing electrical circuits to light bulbs. In: Amery, KnowHow...Magnets, pp. 26-27

Travelling lights - a probe stroked across a box containing electrical circuits causes lights to flash. In: Amery, KnowHow...Magnets, p. 22

Why some Christmas tree lights go out when one bulb burns out, and how the connection can be made differently (circuits in series and in parallel). In: Nelson, Science, pp. 125-126

Wriggly road game - car is steered over a non-conducting material using a magnet and if it runs off course the electrical circuit is completed and a bulb lights up. In: Amery, KnowHow...Magnets, pp. 18-19

ELECTRIC CONDUCTIVITY

Build a conductivity tester. In: Graf, Safe and Simple, pp. 106-107

Conductivity probe - using a simple circuit incorporating a light bulb to test the conductivity of a variety of items. In: Amery, KnowHow... Magnets, p. 17

Electrolytes - demonstration with sugar and salt solutions. In: Brown, 666 Science Tricks & Expts., pp. 348-349

Inexpensive apparatus allowing qualitative comparison of conductivities of various electrolytes and nonelectrolytes. Sci Teach, May '82, p. 52

Measuring the breakdown voltage of insulation and capacitor dielectric materials, and building a tester. In: Giant Handbook, pp. 471-482

Several experiments to determine whether pure water and water with a variety of dissolved substances are good electrical conductors. Instructions on building homemade testing apparatus. In: Morgan, Adventures in Electrochemistry, pp. 43-52

What materials conduct electricity? In: Nelson, Science, p. 123

ELECTRIC CONTROLLERS

ELECTRIC CONTROLLERS
See also, e.g., ELECTRIC RHEOSTATS; REMOTE CONTROL; VOLTAGE REGULATORS

AC power control circuit which can be used as a light dimmer or as speed control for a light duty motor. Pop Elec, Sept. '74, pp. 81-82
Controller for small dc motors. Pop Elec, Oct. '82, p. 98
DC motor control circuit with accelerator and braking action. Pop Elec, Sept. '78, pp. 90-91
DC motor speed controller. Computers & Electronics, Oct. '83, pp. 57-58, 60-62
High torque motor speed control. In: Friedman, 99 Practical, pp. 65-66
Induction motor speed control. In: Friedman, 99 Practical, pp. 64-65
Light-controlled latching switch - can be used for TV sound control, e.g. In: Friedman, 99 Practical, pp. 90-91
Light to current control - controlling heavy direct current by using a LASCR (light-activated silicon controlled rectifier). In: Friedman, 99 Practical, pp. 88-89
Low voltage relay control. In: Friedman, 99 Practical, p. 89
Motor control circuits. Pop Elec, June '78, pp. 92-95
NASA solid-state controller reduces inefficiencies in electric motors. Pop Elec, Oct. '79, pp. 39-43, and corrections Nov. '79, p. 6, Dec.'79, p. 6, and Feb. '80, p. 6, and addition Apr. '80, p. 6
Printed circuit motor control. In: Giant Handbook, pp. 309-310
Two-speed universal motor control. In: Giant Handbook, pp. 315-317

ELECTRIC CURRENT CONVERTERS
Converter box. In: Giant Handbook, pp. 382-383
Current reverser device - can be used as a dimmer for small bulbs and other lighting devices. In: Mendelson, 103 Simple, p. 74
Sine-wave inverter boosts 12 volts dc to 117 volts ac at 100 watts and also recharges storage batteries. Pop Elec, June '76, pp. 43-46

ELECTRIC CURRENT DETECTORS
See also ELECTRIC METERS

Detect electric currents (using magnetized needle in a cork). In: Chapman, Young Scientist, p. 13
How can we make a current detector? Simple device using wire coil and compass. In: Nelson, Science, p. 124
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How electrolysis can rectify an alternating current; how to make a 2-cell experimental electrolytic rectifier. In: Morgan, Adventures in Electrochemistry, pp. 231-235
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Does an electric current produce a magnetic field? In: Nelson, Science, p. 117

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Simple shocker using a toy train transformer; two other electric shockers. In: Brown, 666 Science Tricks & Expts., pp. 61-63

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Device for measuring electricity in the atmosphere. In: Schaefer, A Field Guide, pp. 311-313

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Build a dynamic audio noise filter - ideal add-on device for stereo hi-fi systems. Pop Elec, Apr. '79, pp. 51-55

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Fast-acting resettable electronic fuse. Pop Elec, Feb. '74, pp. 67-69

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High-speed electronic fuse blows within microseconds. Pop Elec, Aug. '81, p. 48

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AC power control circuit which can be used as a light dimmer or as speed control for a light duty motor. Pop Elec, Sept. '74, pp. 81-82

Back-and-forth sequential flasher. Pop Elec, Sept. '78, p. 98

Battery-operated fluorescent lamp. Pop Elec, Aug. '81, pp. 53-55, and correction Jan. '82, p. 6

ELECTRIC LAMPS AND LIGHTING (continued)

Blinker - a conversation-piece gadget consisting of a circuit that causes a neon glow bulb to blink. In: Mendelson, 103 Simple, p. 24

Build a blacklight lantern. Pop Elec, Apr. '75, pp. 35-37

Build a fluorescent utility lamp - operates from a 12-volt dc source. Pop Elec, Oct. '77, pp. 53-55

Build a headlight modulator for cycle safety. Pop Elec, June '81, pp. 71-72, and comment Sept. '81, p. 8

Build a smart switch - solid-state wall switch that "remembers" to turn off the lights. Pop Elec, Sept. '79, pp. 82-83

Build an IC light modulator. Pop Elec, Aug. '73, pp. 88-89

Current reverser device - can be used as a dimmer for small bulbs and other lighting devices. In: Mendelson, 103 Simple, p. 74

Dark-on light - circuit which will turn on incandescent lights at dusk and off at dawn. Pop Elec, Aug. '75, p. 85

Design your own color organ - changing colored lights keep time to the music from a stereo, for example. Pop Elec, May '73, pp. 62-63

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Digital color organ. Pop Elec, July '80, p. 93

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Flashing light, flashes about once per second. In: Mendelson, 103 Simple, p. 121

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Light bulb. In: Clarke, Encyclopedia of How It Works, pp. 136-138

Light chaser: a microprocessor controller for light shows. Computers & Electronics, Oct. '83, pp. 70-71, 74-75

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Light comparator, allowing adjustment of two light sources to equal intensity. In: Friedman, 99 Practical, pp. 55-56

Light dimmer control using silicon-controlled rectifier (half wave). In: Mendelson, 103 Simple, p. 73

Light flasher for emergency use or for visibility when on a bicycle - how to make, using transistors. In: Malcolm, How to Build Electronic Projects, pp. 94-97

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Low-cost remote control of appliances and lights. Pop Elec, May '75, pp. 46-47

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Minidrain pilot lamp for portable equipment, using a transistor. In: Friedman, 99 Practical, pp. 62-63

Model lighting system for streets and houses. In: Cherrier, Fascinating... Physics, pp. 54-57

Night light construction - develops skills in plastics, metals and electricity. In: Giant Handbook, pp. 313-315

1-Hz IC blinker. In: Giant Handbook, pp. 373-374

Physics with flashers - a good, cheap, accurate, easy-to-use flashing light source and its use in physics experiments involving pendulums, acceleration, and velocity. Sci Teach, Sept. '83, pp. 42-44, 49

Pocket color organ. Pop Elec, Mar. '80, pp. 92-93

Protect your home with the burglar baffler - provides programmable pseudorandom lighting. Pop Elec, July '81, pp. 65-68, and correction Nov. '81, p. 8

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"Smart" greenhouse light controller. Pop Elec, May '81, pp. 67-69

Some simple VMOS circuits - lamp dimmer, pulse-modulated light flasher. Pop Elec, Feb. '82, pp. 96-97

Stage lighting for the amateur - controls 1500 watts per channel with preset storage, cross fading, and subgrouping. Pop Elec, Mar. '73, pp. 35-37

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Tenna-blitz - flashing lamp for attaching to car radio antenna, constructed using transistors. In: Friedman, 99 Practical, pp. 25-26

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Triac light dimmer (full wave). In: Mendelson, 103 Simple, p. 72

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ELECTRIC LIGHT BULB

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ELECTRIC LIGHTING

See ELECTRIC LAMPS AND LIGHTING

ELECTRIC METERS

ELECTRIC METERS

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Build a multiple-choice digital multimeter. Pop Elec, Feb. '79, pp. 63-69 and addition July '79, p.6
Build a photometer/enlarger exposure meter. Pop Elec, May '75, pp.48-51
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Electronic applause meter and its use. In: Giant Handbook, pp. 328-333
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Power meter keeps tabs on how much electricity an appliance uses. Pop Elec, Aug. '82, pp. 54-55
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Relative field strength meter. In: Carr, 104 Weekend, pp. 107-109
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Single-LED analog meter. Pop Elec, Sept. '81, pp. 81-82
Sound-level meter and its use. In: Giant Handbook, pp. 321-324
Stereo-balance meter. In: Mendelson, 103 Simple, p. 49

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Tunable FSM (field-strength meter). In: Friedman, 99 Practical, pp. 43-44

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VU meter - enables watch to be kept on audio recording levels. In: Mendelson, 103 Simple, p. 105

VU meter with no moving parts. Pop Elec, Feb. '75, pp. 40-41

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How to supply electric power to something that is turning - patented device for making a direct electrical connection with flexible conductors between a fixed power source and a continuously rotating load. Sci Am, Dec. '75, pp. 120-123, 148
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Voltage-sensitive switch (used with normally open relay) - relay energizes when voltage level exceeds a predetermined value; circuit usable with 100 volts or less input. In: Mendelson, 103 Simple, p.122

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Digitally programmable VMOS variable resistor. Computers & Electronics, Mar. '83, p. 114

Making your own pressure-sensitive resistors. Computers & Electronics, Nov. '82, p. 124

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Automatic amplifier switch. Pop Elec, Jan. '73, pp. 52-53

Build a remote antenna selector switch - permits selecting among six antennas. Pop Elec, Jan. '79, pp. 65-67

Build a smart switch - solid-state wall switch that "remembers" to turn off the lights. Pop Elec, Sept. '79, pp. 82-83

Build a touch-controlled solid-state switch - can be used for TTL or MOS. Pop Elec, July '82, p. 66

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Light-controlled latching switch - can be used for TV sound control, e.g. In: Friedman, 99 Practical, pp. 90-91

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Solid-state level-sensing switch for sump pumps, also able to sound alert. Pop Elec, Aug. '79, pp. 31-33

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Balun transformer. In: Carr, 104 Weekend, pp. 126-128

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High-voltage DC/DC voltage converters. Pop Elec, Oct. '76, pp. 107-109

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Sine-wave inverter boosts 12 volts dc to 117 volts ac at 100 watts and also recharges storage batteries. Pop Elec, June '76, pp. 43-46

12-VDC-to-117-VAC inverter, especially useful in autos and small boats. In: Mendelson, 103 Simple, p. 111

Versatile Variac, a variable autotransformer. In: Giant Handbook, pp. 394-397

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Materials needed for simple electrical experiments and constructions; preparing wires, wiring batteries and bulb holders, etc. In: Amery, KnowHow...Magnets, pp. 10-11

Several projects involving electrical wiring - wiring panel, ground wire tester, method of eliminating power line interference by wiring in electrical parts, etc. In: Giant Handbook, pp. 362-367

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Electricity from a lemon, using a nail and copper wire. In: Brown, 666 Science Tricks & Expts., p. 217

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Investigating the amount of electric energy used in your home. Sci Teach, Sept. '83, p. 60

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The electrochemical process of rusting - experiment to demonstrate that rusting is an electrochemical action. In: Morgan, Adventures in Electrochemistry, pp. 259-263
Electrochemistry - experiment using a salt solution, a 6-volt battery and a copper wire. In: Graf, Safe and Simple, pp. 80-81
Experiment demonstrating that electrochemical action can cause changes in a solution. In: Morgan, Adventures in Electrochemistry, pp. 266-267
Semi-micro electrochemistry. Sci Teach, Oct. '80, p. 32

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Amperometric titrations: titration of lead and titration of sulfate ion, using a dropping mercury electrode. In: Skoog, Fundamentals, pp. 760-761 and chapter 21

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Voltameter apparatus produces chlorine and hydrogen from a sodium chloride solution and can be constructed to make explosive soap bubbles. In: Cherrier, Fascinating...Chemistry, pp. 86-87

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Electrolytes - demonstration with sugar and salt solutions. In: Brown, 666 Science Tricks & Expts., pp. 348-349
Inexpensive apparatus allowing qualitative comparison of conductivities of various electrolytes and nonelectrolytes. Sci Teach, May '82, p. 52

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Several experiments to determine whether pure water and water with a variety of dissolved substances are good electrical conductors. Instructions on building a homemade testing apparatus. In: Morgan, Adventures in Electrochemistry, pp. 43-52

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How to show the electromagnetic field in three dimensions. In: Graf, Safe and Simple, p. 94

The magic diver - an experiment using the principles of electromagnetism. Nail in a cork can be made to submerge in a vial of water using an electromagnetic coil. In: Graf, Safe and Simple, pp. 103-104

Magnetic field around a current-carrying conductor. In: Graf, Safe and Simple, pp. 88-90

Magnetism produces electricity. In: Graf, Safe and Simple, pp. 97-99

Projects showing the relationship between electricity and magnetism - electric current producing magnetism, current in coil producing magnetic poles, and making an electromagnet stronger. In: Baldini, Student Science Activities, pp. 32-38

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Showing the magnetic field in another way. In: Graf, Safe and Simple, p. 90

Unfriendly paper clips - a simple experiment in electromagnetism using a battery, a coil of wire and some paper clips. In: Graf, Safe and Simple, pp. 95-96

What conducts magnetism? Effect on a compass of inserting various objects into a cardboard tube wound with a wire carrying electric current. In: Brown, 666 Science Tricks & Expts., p. 222

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Wire carrying an alternating current is attracted and repelled by a permanent magnet. In: Brown, 666 Science Tricks & Expts., pp. 222-223
A wire picks up iron filings. In: Graf, Safe and Simple, p. 91

ELECTROMAGNETS
See also ELECTROMAGNETISM; SOLENOIDS; devices, such as ELECTRIC BELLS, which use electromagnets

Construction of an electromagnet and experiments in electromagnetism. In: Wels, Science, pp. 101-104
Electro-magnet. In: Tuey, How to Be, pp. 54-55
Electromagnet - how does it work. In: Papallo, What Makes It Work, pp. 92-93
Game involving trying to drop a small screw or nail, held up by an electromagnet, into a swinging tray by turning off the magnet at the right moment. In: Amery, KnowHow...Magnets, pp. 44-45
How can we make an electromagnet? In: Nelson, Science, p. 118
How to magnetize your screwdriver. In: Graf, Safe and Simple, p. 95
Inverse square relationship - an experiment using an electromagnet. Sci Teach, Mar. '75, pp. 53-55 and comments May '75, pp. 4-5
Make a simple electromagnet (insulated wire wound on an iron nail). In: Chapman, Young Scientist, p. 13
Making an electro-magnet. In: Amery, KnowHow...Magnets, p. 40
Making an electromagnet. In: Graf, Safe and Simple, pp. 93-94
Making an electromagnet. In: Penrose, Dr. Zed's Dazzling, pp. 22-23
Pencil magnet and loop magnet. In: Brown, 666 Science Tricks & Expts., pp. 224-225
Simple game using a swinging electromagnet - which number will paper clip fall on when electromagnet is switched off? In: Amery, KnowHow...Magnets, p. 41
Some projects using electromagnets: telegraph code practice set, junkyard crane, magnetic dunking machine, metal engraving tool, electric buzzer. In: Stanley, Easy to Make, pp. 9-34, 49-55
Spinning number wheel game, using an electromagnet. In: Amery, KnowHow...Magnets, p. 46
Using an electromagnet to make a pick-up truck toy. In: Amery, KnowHow... Magnets, pp. 42-43

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Electron microscope built by a high school physics club. Sci Am, Sept. '73, pp. 184-189, 200
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Optical simulation of the electron microscope, using laser light. In: Kallard, Exploring, pp. 217-218

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See ELECTRIC ALARMS

ELECTRONIC APPARATUS AND APPLIANCES
See also, e.g., AMPLIFIERS (ELECTRONICS); ANTENNAS (ELECTRONICS); ATTENUATOR (ELECTRONICS); AUTOMATIC TIMERS; COMPUTERS; DIODES, SEMICONDUCTOR; headings beginning with ELECTRIC and ELECTRONIC; FREQUENCY METERS; GENERATORS, ELECTRONIC; INTERCOMMUNICATION SYSTEMS; LIE DETECTORS AND DETECTION; METAL DETECTORS; MULTIVIBRATORS; OSCILLATORS, ELECTRIC; OSCILLOGRAPH; RADIO; TELEVISION; TRANSISTORS; and other related headings

ELECTRONIC APPARATUS AND APPLIANCES

ELECTRONIC APPARATUS AND APPLIANCES (continued)

Analog to digital converters. Pop Elec, Sept. '78, pp. 92, 94-97, and Oct. '78, pp. 82-85, and correction Jan. '79, p. 8

Automatic garage-door closer. Pop Elec, Mar. '79, pp. 69-71, and corrections July '79, p. 6 and Oct. '79, p. 8, and comment June '79, p. 6

Back-and-forth sequential flasher. Pop Elec, Sept. '78, p. 98

Blinker - a conversation-piece gadget consisting of a circuit that causes a neon glow bulb to blink. In: Mendelson, 103 Simple, p.24

Build a low-cost A/D converter. Pop Elec, Sept. '78, pp. 45-49

Build a miniature environmental test chamber which can be set from 14°F to 158°F with 1-degree accuracy; can be used to test circuits at unusual temperatures. Pop Elec, Feb. '74, pp. 34-39

Build a portable analog/digital memory translator. Pop Elec, Apr. '75, pp. 27-30

Build electronic bugle-call generator with an audio amplifier for mobile or home use. Pop Elec, Jan. '78, pp. 45-48 and correction Mar. '78, p. 10

Build the surfer - device simulates sound of surf, gentle rain or white noise to provide a tranquil background. Pop Elec, June '79, pp. 64-67

CMOS tone sequencer. Pop Elec, Nov. '79, pp. 117-118

Design your own color organ - changing colored lights keep time to the music from a stereo, for example. Pop Elec, May '73, pp. 62-63

Device for graphically depicting characteristic curves of electrical components when connected to an oscilloscope. In: Giant Handbook, pp. 310-313

Digital color organ. Pop Elec, July '80, p. 93

Digital electronic counter counts from zero to 999. In: Giant Handbook, pp. 466-468

Digital to analog converters. Pop Elec, July '78, pp. 82-83 and Aug. '78, pp. 76-77, and corrections Sept. '78, p. 6 and Dec. '78, p.89

Dual tone decoder IC. Pop Elec, Dec. '73, pp. 81-82

Electronic aids for the handicapped. Pop Elec, Apr. '81, pp. 83+

Electronic circuit for a public address system. In: Traister, First Book, pp. 38-40

Electronic liquid-level indicator for the blind. Pop Elec, Apr. '81, p.96

Electronic project which turns electrical appliances on or off at the clap of your hands. Pop Elec, July '79, p. 64 and correction Sept. '79, p. 6

Electronic scorekeeper for recreation rooms. Pop Elec, Oct. '79, pp. 74-75, and correction June '80, p. 6

Electronic tuning - basic circuit in which a varactor is used for electronic tuning. In: Friedman, 99 Practical, p. 58

Experimenting with an air pressure switch. Pop Elec, Sept. '81, pp. 90-94

Flashing light, flashes about once per second. In: Mendelson, 103 Simple, p. 121

Flip-flops and decade counters. Pop Elec, Feb. '77, pp. 75-76, and Mar. '77, pp. 96-98

Four easy-to-build LED projects - blinker, flasher, binary counter, and wheel of fortune. Pop Elec, Apr. '78, pp. 80-83

Ground fault interrupter eliminates risk of fatal electric shock. Pop Elec, Apr. '74, pp. 44-46

High-current LED pulser. Pop Elec, July '79, p. 90

High-resolution LED display. Pop Elec, Mar. '79, pp. 94-95

Hobbyist's modem. Pop Elec, Mar. '76, pp. 43-46, 49-50, and correction May '76, p. 6

ELECTRONIC APPARATUS AND APPLIANCES (continued)

"Icy road warning indicator" circuit. Pop Elec, Aug. '77, pp. 71-72
In/out counter circuit allows counting people entering an area. Pop Elec, Mar. '82, p. 102
Inexpensive signal tracer and signal probe and their uses. In: Giant Handbook, pp. 458-465
Interfaced clock module ideal for turning lights and appliances on and off. Computers & Electronics, Oct. '83, pp. 104-106
LED transmitter module. Pop Elec, Feb. '79, p. 82
Light comparator, allowing adjustment of two light sources to equal intensity. In: Friedman, 99 Practical, pp. 55-56
Low-cost analog-to-digital converter. Pop Elec, Aug. '80, pp. 81-82
Missing-pulse detectors. Pop Elec, Sept. '79, pp. 89-91
Moisture sensor circuit. Pop Elec, Apr. '75, p. 87
The Morse-a-word: LED readout displays words and numbers when Morse code is received. Pop Elec, Mar. '79, pp. 35-39, and Apr. '79, pp. 57-59, 64-66, and correction May '79, p. 6
Nixie numbers - using Nixie (neon digital indicator) tube to transmit numerical signals. In: Friedman, 99 Practical, pp. 58-59
1-Hz IC blinker. In: Giant Handbook, pp. 373-374
Pocket color organ. Pop Elec, Mar. '80, pp. 92-93
Pulse duration counter. Computers & Electronics, May '83, pp. 56-58
Random 4-digit number generator circuit for games, experiments, etc. Pop Elec, Sept. '76, pp. 100-101, and simplification Apr. '77, pp. 69, 74
Rocket launcher switch box. In: Giant Handbook, pp. 163-164, 174
Simple BCD keyboard encoder. Pop Elec, Aug. '81, p. 90
Simple color organ circuit. Pop Elec, Oct. '74, p. 101
Simple, inexpensive IC decision maker. In: Giant Handbook, pp. 279-280
Space-age electronic projects for boats. Pop Elec, July '79, pp. 39-43 and Aug. '79, pp. 55-59, and additions Oct. '79, p. 8 and Nov. '79, p.6
Special counter circuits for experimenters. Pop Elec, Sept. '80, pp.98-101
Supersonic transceiver. In: Mendelson, 103 Simple, p. 29
Telemetry decoder. In: Carr, 104 Weekend, pp. 53-58
Treasure finder using a transistor radio as a detector. In: Friedman, 99 Practical, pp. 119-120
Ultra-simple circuit to replace a carpenter's level - LED lights indicate tilting. Computers & Electronics, Dec. '82, p. 82, and correction Feb. '83, p. 7
Universal decade counter stage. In: Carr, 104 Weekend, pp. 58-62
Universal differentiator. In: Carr, 104 Weekend, pp. 42-47
Universal integrator. In: Carr, 104 Weekend, pp. 34-42
Voice-controlled train. In: Giant Handbook, pp. 319-321
Voice scrambler. Pop Elec, Sept. '74, pp. 56-61, and additional comment Jan. '75, p. 6

ELECTRONIC APPARATUS AND APPLIANCES - TESTING

See also ELECTRIC APPARATUS AND APPLIANCES - TESTING; TRANSISTORS - TESTING

Audio sniffer - an audio signal tracer for finding problems in audio equipment. In: Friedman, 99 Practical, pp. 105-106
Aural continuity tester. In: Carr, 104 Weekend, pp. 68-69
Build a low-cost op-amp tester. Pop Elec, Dec. '73, pp. 34-35
Build a polarity-sensing continuity tester. Pop Elec, Oct. '74, p.66
Build a thyristor tester. Pop Elec, July '73, pp. 45-48, and update Nov. '73, p. 10

ELECTRONIC APPARATUS AND APPLIANCES - TESTING (continued)

Build a "universal" digital probe. Pop Elec, Feb. '75, pp. 48-49, and correction June '75, p. 6, and addition Nov. '75, p. 6

Build an audible logic probe. Pop Elec, July '80, pp. 73-74, and addition Oct. '80, p. 7

Continuity tester and its use. In: Giant Handbook, pp. 415-417

Electronic diagnostic instrument for locating and identifying problems in battery or charging systems. Pop Elec, Jan. '79, pp. 62-64, and addition Aug. '80, p. 6

Extinction-type neon voltmeter and continuity checker, using a printed circuit. In: Giant Handbook, pp. 262-266

Filament-continuity tester enables testing for open filaments of vacuum tubes, flashlight bulbs, indicator lamps, etc., and fuses of all kinds. In: Giant Handbook, pp. 438-440

LED-output continuity tester. In: Carr, 104 Weekend, pp. 67-68

Low-cost digital logic analyzer. Pop Elec, Feb. '77, pp. 40-46, and address addition Apr. '77, p. 6

Microphone beeper to check out audio system. In: Friedman, 99 Practical, pp. 100-101

Micropower audible continuity tester. Pop Elec, May '74, p. 47

Simple logic probe. Pop Elec, May '76, p. 60, and correction July '76, p.6

Simplified combination tester and its use - can be voltmeter or neon test light. In: Giant Handbook, pp. 427-428

VTVM-VOM operation tester and its use. In: Giant Handbook, pp. 427-432

ELECTRONIC BELLS
See ELECTRIC BELLS

ELECTRONIC BUZZER
See ELECTRIC BUZZER

ELECTRONIC CALCULATING MACHINES
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Build a scientific calculator. Pop Elec, Jan. '75, pp. 53-57, and addition Mar. '75, p. 6, and correction May '75, p. 6

Build a scientific programmable calculator. Pop Elec, May '76, pp. 36-38, and correction Aug. '76, p. 6

Build the 'senior scientist' calculator. Pop Elec, Oct. '75, pp. 33-38, and correction Jan. '76, p. 6

How a calculator works. In: How Things Work, pp. 66-69

Theft alarm for handheld calculators. Pop Elec, Mar. '76, p. 42

ELECTRONIC CIRCUITS
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Analog computer circuits. Pop Elec, Jan. '79, pp. 81, 83-84, and Feb. '79, pp. 80-85

Basic ac phase-control circuit with a wide variety of uses. Pop Elec, Dec. '77, pp. 84-86

Basic IR emitter-driver and emitter-pulser circuits. Pop Elec, Aug. '78, pp. 66-67, 72-73, and correction Jan. '79, p. 8

The bits and pieces of electronic circuits (parts diagrams, circuit signs and what the parts do); precautions with CMOS circuits; resistor color code. In: Duncan, Adventures, pp. 4-6, 9

ELECTRONIC CIRCUITS (continued)

Build the CMOS microlab - test or learn digital logic, breadboard or test digital circuits, etc. Pop Elec, June '74, pp. 40-44

Building circuits. In: Duncan, Adventures, pp. 7-8

CMOS astable/monostable multivibrator. In: Duncan, Adventures, pp. 14-16

CMOS dual bistable multivibrator. In: Duncan, Adventures, pp. 16-18

CMOS quad two-input NAND gate (4011B); AND gate circuit; connecting up OR and NOR gates. In: Duncan, Adventures, pp. 19-21

Circuits using optoelectronic couplers. Pop Elec, May '78, pp. 66-69, 74

Computer trainer - circuit useful in demonstrating basic computer concepts. In: Giant Handbook, pp. 124-129, 132-133

Digital counter-binary number system demonstrator - an electronic circuit construction. In: Giant Handbook, pp. 140-144

Digital frequency-divider circuit. Pop Elec, May '78, pp. 69, 74

Digital-logic automatic pump control circuit. Pop Elec, June '78, pp. 95-96

Digital meter circuits. Pop Elec, Mar. '78, pp. 76-79

Digitally programmable VMOS variable resistor. Computers & Electronics, Mar. '83, p. 114

Dip soldering printed circuit boards. In: Giant Handbook, pp. 253-257

Dual astable/monostable multivibrator. In: Duncan, Adventures, pp. 10-13

Easy way to make PC boards - the photopositive way. Pop Elec, Oct. '73, pp. 65-69

Electronic circuit for flashing a string of lights. Pop Elec, Jan. '78, pp. 64, 66

Electronic circuitry for binary-decimal number demonstrator. In: Giant Handbook, pp. 145-154

Electronic project layout and circuit board construction. In: Malcolm, How to Build Electronic Projects, pp. 72-91

Etched electronic circuits. In: Giant Handbook, pp. 168-169

Experimenting with electronic flash circuits, including a xenon strobe flasher circuit. Computers & Electronics, May '83, pp. 90-92, and correction Oct. '83, p. 106

Experimenting with low-power integrated circuits. Pop Elec, May '82, pp. 98-100

Experimenting with phase-locked loop IC's: four simple circuits. Pop Elec, Oct. '75, pp. 47-50 and correction Dec. '75, p. 6, and addition Jan. '76, p. 6

Experimenting with simple programmable read-only memories. Pop Elec, Nov. '77, pp. 77-79

Experiments with programmable logic arrays. Pop Elec, June '78, pp. 88-90, and comment Oct. '78, p. 6

Flip-flop computer demonstrator. In: Giant Handbook, pp. 214-221

Frequency indicator circuit designed to monitor a single frequency tone. Pop Elec, Feb. '74, pp. 103-104

Fuzz-box circuit changes tones of an electric guitar to sounds similar to those produced by an electronic music synthesizer. Pop Elec, Mar. '78, p. 79

Getting started with op amps. Pop Elec, June '75, pp. 46-48

How to design pc boards from a schematic. Pop Elec, Sept. '78, pp.50-53

How to make double-sided pc boards. Pop Elec, June '74, pp. 27-32, with additional comments Nov. '74, p. 7

In pursuit of glitches - how to banish elusive problems that haunt your circuits. Pop Elec, July '81, pp. 57-60

ELECTRONIC CIRCUITS

ELECTRONIC CIRCUITS (continued)

Introduction to simple electronic circuits using some basic electronic devices (diode, resistor and capacitor). In: Traister, First Book, pp. 7-17

Keying and vca circuits for electronic music instruments. Pop Elec, Jan. '75, pp. 60-63 and Feb. '75, pp. 37-39

LED flasher circuit. Pop Elec, Nov. '76, p. 92

Light flasher, using a transistor (flip-flop multivibrator). In: Friedman, 99 Practical, pp. 54-55

Line-voltage indicator circuit and pulser circuit. Pop Elec, Feb. '74, pp. 103-104

Missing-pulse detector circuits. Pop Elec, Sept. '79, pp. 89-91

Monostable, bistable and astable multivibrators using the TTL NAND gate. Pop Elec, June '76, pp. 102-103

Monostable multivibrator. Pop Elec, May '78, pp. 76-77

Motor control circuits. Pop Elec, June '78, pp. 92-95

No fuss circuit board etching. In: Giant Handbook, pp. 257-260

Perforated board wiring techniques for experimenters. Pop Elec, Apr. '76, pp. 66-68, 70

Photomechanical production of printed circuits. In: Giant Handbook, pp. 222-226

Practical applications of CMOS in logic circuits. Pop Elec, Apr. '74, pp. 59-64

Printed circuits via electrical tape. In: Giant Handbook, pp. 238-240

Simple circuits using the VMOS power FET - audio alarms, lamp dimmers, battery chargers, etc. Pop Elec, Sept. '81, pp. 61-64

Six CMOS circuits for experimenters - automatic keyboard repeat, contact debouncer, square-wave and digital sine-wave generators, alternate action pushbutton, touch control latch. Pop Elec, Apr. '77, pp. 46-47

Solderless breadboards for experimenters. Computers & Electronics, Apr. '83, pp. 104-106

Some simple VMOS circuits - lamp dimmer, pulse-modulated light flasher. Pop Elec, Feb. '82, pp. 96-97

Telephone-activated light circuit for the handicapped. Pop Elec, Mar. '78, p. 86

Transfer printed pc patterns with no camera or chemicals. Pop Elec, Feb. '78, pp. 46-47

Two computer video display units - circuitry for single-character display and single-line 16 character display. In: Giant Handbook, pp. 179-181, 183-189

Two-way signaler - with this circuit you can use two wires to transmit two signals. In: Friedman, 99 Practical, p. 125

With a simple circuit teach your digital clock to control appliances. Pop Elec, May '82, pp. 73-74, 80

ELECTRONIC CIRCUITS - TESTING

Assemble a low-cost logic probe. Pop Elec, Sept. '73, p. 56, and additional comments May '74, p. 8 and Sept. '74, pp. 6-7

Audible pulse indicator. Pop Elec, Oct. '81, p. 118

Basic logic probe circuit. Pop Elec, Oct. '80, p. 85

Build a miniature environmental test chamber which can be set from 14°F to 158°F with 1-degree accuracy; can be used to test circuits at unusual temperatures. Pop Elec, Feb. '74, pp. 34-39

Build a digital IC tester. Pop Elec, June '77, pp. 53-59

Build a direct-reading logic probe. Pop Elec, Sept. '75, pp. 54-56, and correction Nov. '75, p. 6

ELECTRONIC CIRCUITS - TESTING (continued)

Easy-to-build continuity tester. Pop Elec, May '75, p. 33
IC digital logic memory probe. Pop Elec, Mar. '74, pp. 33-35
Low-cost 16-LED logic monitor. Pop Elec, June '80, pp. 69-71
Mini troubleshooter for miniaturized circuits. In: Giant Handbook, pp. 434, 436-437
Polarity tester to protect electronic circuitry. In: Friedman, 99 Practical, p. 126
Radio-TV signal tracer. In: Mendelson, 103 Simple, pp. 93-94
10-LED logic probe. Pop Elec, Sept. '82, pp. 72+

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ELECTRONIC FUSES
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ELECTRONIC GAGES
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Automotive econometer - solid-state vacuum gauge monitors gas consumption and driving habits. Pop Elec, Feb. '80, pp. 58-60, and correction June '80, p. 6
Digital fuel gauge. Pop Elec, Dec. '76, pp. 59-62
Electronic level indicator for boat gas tanks. Pop Elec, June '82, pp. 62-63
Water-level indicator is electronic circuit employing transistors. In: Malcolm, How to Build Electronic Projects, pp. 102-104
Windshield-solution indicator using integrated circuit and LED. In: Malcolm, How to Build Electronic Projects, pp. 128-130

ELECTRONIC GAMES
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Audio-visual CMOS toy. Pop Elec, Oct. '73, pp. 38-39
Binary hi-lo game - helps you to learn to think in binary numbers. Pop Elec, June '79, p. 95
Build a CMOS game computer. Pop Elec, May '74, pp. 58-61
Build a COSMOS (complementary-symmetry metal-oxide semiconductor) die. Pop Elec, June '73, pp. 58-60
Build a computer-vs.-you chess game. Pop Elec, Dec. '78, pp. 49-51, 56-58
Build an electronic space-war game. Pop Elec, Apr. '76, pp. 41-45, and additions June '76, p. 6 and July '76, p. 6, and corrections Aug. '76, p. 6 and Oct. '76, p. 6
Build Odds-On, a game of chance and strategy. Pop Elec, Nov. '76, pp.64-65
Build Pongtronics, low-cost video game for two players. Pop Elec, Apr. '76, pp. 35-41, and addition May '76, pp. 61-65, and correction Oct. '76, p. 6
Build the LED target game. Pop Elec, June '77, pp. 50-52
Circuits for use in a variety of electronic toys. Pop Elec, Dec. '74, pp. 79, 88-90
Electronic coin flipper. Pop Elec, Nov. '76, pp. 91-92
Electronic "coin-flipper" circuit. Pop Elec, July '75, p. 66
Electronic dice. In: Duncan, Adventures, pp. 40-43
Electronic game or puzzle circuit. Pop Elec, Sept. '75, pp. 87-88
Electronic magic box. Pop Elec, Jan. '80, pp. 61-66

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ELECTRONIC GAMES (continued)

Electronic squawk box toy. Pop Elec, Mar. '73, p. 46

Electronic wheel of fortune simulates mechanical game. Pop Elec, Oct. '75, pp. 69-70

Executive decision maker game with integrated circuit and LED's. In: Malcolm, How to Build Electronic Projects, pp. 123-125

Executive digital temper countdowner - displays the numbers 0 to 9, then produces an audible noise. Pop Elec, Dec. '74, pp. 92-93

Have fun with electronic dice. Pop Elec, July '75, pp. 48-49

Little roulette wheel with integrated circuit and LED displays. In: Malcolm, How to Build Electronic Projects, pp. 120-123

Logidex: an electronic game for all seasons. Pop Elec, Nov. '73, pp. 63-66, and correction Apr. '74, p. 8

Multiplayer LED racing game. Pop Elec, Mar. '77, pp. 77-79, 84-85, and corrections June '77, p. 6 and July '77, p. 7

Play video games on your oscilloscope. Pop Elec, Dec. '79, pp. 56-58

Quiz-game electronics. Pop Elec, Feb. '77, pp. 64-65

Random 4-digit number generator circuit for games, experiments, etc. Pop Elec, Sept. '76, pp. 100-101, and simplification Apr. '77, pp. 69, 74

Simple electronics game. In: Giant Handbook, pp. 310-312

To the electronic races! - an electronic game. Pop Elec, Dec. '77, pp. 52-55 and correction May '78, p. 6

Tug-of-War; electronic game built around 555 timer devices. Pop Elec, Feb. '75, pp. 43-47

ELECTRONIC GENERATORS

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ELECTRONIC KEYBOARD

Low-cost, fully professional ASCII keyboard and encoder you can build. Pop Elec, Apr. '74, pp. 27-31

ELECTRONIC METERS

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ELECTRONIC MUSIC

See also MUSICAL INSTRUMENTS, ELECTRONIC

Build a super electronic music maker. Pop Elec, Nov. '80, pp. 83-87, and additions Apr. '81, p. 6

Build an envelope modification unit - can be used to vary attack, sustain, and decay of any electronic instrument. Pop Elec, July '79, pp. 65-67

Build an electronic bugle-call generator with an audio amplifier for mobile or home use. Pop Elec, Jan. '78, pp. 45-48, and correction Mar. '78, p. 10

Electronic music pitch standards, including construction of a voltage-controlled oscillator with memory. Pop Elec, Jan. '74, pp. 39-43

Envelope generators and sequencers for electronic music. Pop Elec, Jan. '76, pp. 58-62

How electronic music synthesizers work. Pop Elec, Apr. '78, pp. 56-59

Music modules to build your own synthesizer. Pop Elec, June '76, pp.59-66

ELECTRONIC MUSIC (continued)
Pitch generators for electronic music. Pop Elec, Feb. '74, pp.98-101 and Mar. '74, pp. 50-53
Voltage-controlled oscillator with sine, triangle, square-wave and pulse outputs - for electronic music. Pop Elec, Mar. '77, pp. 42-44

ELECTRONIC MUSICAL INSTRUMENTS
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ELECTRONIC NOISE
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ELECTRONICS
See also headings beginning with ELECTRONIC; and specific pieces of electronic apparatus, e.g., AMPLIFIERS (ELECTRONICS); GENERATORS, ELECTRONIC; TRANSISTORS

How to custom design plastic cases for electronics projects. Pop Elec, Sept. '77, pp. 81-84
How to dress up your electronics projects. Pop Elec, Nov. '77, pp. 53-55
Tools and equipment for electronics workbenches. Pop Elec, Mar. '80, pp. 49+

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Electrography: a metal detective story. Sci Teach, May '83, pp. 52-53

ELECTROPHORESIS
Inexpensive electrophoresis apparatus made from items usually found in a high school laboratory. Sci Teach, Dec. '81, p. 35

ELECTROPHORUS
Building an electrophorus. In: Graf, Safe and Simple, pp. 16-17
Homemade electrophoruses. Sci Teach, Sept. '79, pp. 42-44
Using the electrophorus. In: Graf, Safe and Simple, pp. 17-18

ELECTROPHYSIOLOGY
See also MOTOR ABILITY; MUSCLES; NERVES

Build an alpha brain wave feedback monitor. Pop Elec, Jan. '73, pp. 40-45

ELECTROPLATING
See also PLATING; SILVERING

Copper-plating a piece of paper. In: Morgan, Adventures in Electrochemistry, pp. 243-244
Cupric ion is blue - electroplating of copper from a copper sulfate solution. In: Morgan, Adventures in Electrochemistry, pp. 220-221

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ELECTROPLATING (continued)

Electrogravimetric analysis: determination of copper in an aqueous solution, and separation and determination of copper and nickel in alloys. In: Skoog, Fundamentals, pp. 756-758

Electroplater and battery charger - output 0 to 14 volts dc at 1 amp. In: Mendelson, 103 Simple, p. 20

Electroplating a carbon rod with copper. In: Morgan, Adventures in Electrochemistry, pp. 242-243

Electroplating of nickel and of copper. In: Giant Handbook, pp. 266-269

How to electroplate copper and nickel on leaves. Sci Teach, Oct. '74, pp. 42-45

Immersion plating - copper sulfate solution and a screwdriver. In: Morgan, Adventures in Electrochemistry, pp. 140-141

Immersion plating experiment (zinc sheet and copper sulfate solution), and an explanation in electrochemical terms. In: Morgan, Adventures in Electrochemistry, pp. 141-144

Lead chemistry - lead plates out on zinc suspended in a lead acetate solution. In: Brown, 666 Science Tricks & Expts., pp. 366-367

The lead "tree" - an electrochemical experiment using zinc and a lead acetate solution. In: Morgan, Adventures in Electrochemistry, pp. 144-145

Lead tree in gel - reaction in which lead from solution plates out on mossy zinc. In: Chen, Entertaining, p. 81

Making a silver tree with copper wire and a silver nitrate solution. In: Chen, Entertaining, p. 81

Nickel-plating. In: Morgan, Adventures in Electrochemistry, p. 244

Silver electroplating. In: Giant Handbook, pp. 268-273

The silver "tree" - electrochemical experiment using a silver nitrate solution and copper. In: Morgan, Adventures in Electrochemistry, p. 146

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Building a proof plane to transfer charge from a highly charged body to an electroscope. In: Graf, Safe and Simple, pp. 20-21

Building and using a leaf electroscope. In: Graf, Safe and Simple, pp. 11-14

Discharging your electroscope by radiation or ionization. In: Graf, Safe and Simple, pp. 14-15

Electronic electroscope. Pop Elec, Jan. '82, pp. 59-61

Electroscope. Pop Elec, Feb. '73, p. 90

Homemade electroscopes. Computers & Electronics, Sept. '83, pp. 90-93

How to make a pill box electroscope and produce static electricity. In: Baldini, Student Science Activities, pp. 15-17

Invisible power - a simple electroscope. In: Tuey, How to Be, pp. 56-57

Shielding your electroscope. In: Graf, Safe and Simple, pp. 18-19

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Can electricity be produced by friction? In: Nelson, Science, p. 120

Cereal static indicator - demonstration using a phonograph record. In: Herbert, Mr. Wizard's, p. 13

Charge a balloon. In: Graf, Safe and Simple, pp. 3-4

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Charge yourself - experiment using a woolen rug and a fluorescent tube. In: Graf, Safe and Simple, p. 3

Cleaning your records electrostatically. In: Graf, Safe and Simple, p. 35

Creating static electricity by rubbing; effects of charged objects on bits of paper and on a narrow stream of water. In: Gardner, Moving Right Along, pp. 133-134

Demonstrating static electricity using a balloon and gelatin to make gelatin stalagmites. In: Herbert, Mr. Wizard's, p. 21

Demonstrations and discussion of static electricity. In: Stein, Science Book, pp. 224-227

Demonstrations of static electricity, including electrostatic dancing men. In: Richards, Science Magic, pp. 52-53

Discharging your electroscope by radiation or ionization. In: Graf, Safe and Simple, pp. 14-15

Do substances with like charges repel or attract each other? Simple demonstration with sealing-wax rod and pith balls. In: Nelson, Science, p. 122

Does static electricity affect water flow? In: Nelson, Science, p. 121

Drawing sparks from a dry newspaper. In: Graf, Safe and Simple, pp.6-7

Electrostatic merry-go-round. In: Graf, Safe and Simple, pp. 27-28

Electrostatic motors powered by the electric field of the earth. Sci Am, Oct. '74, pp. 126-130, 133, 142

Electrostatic palm tree. In: Graf, Safe and Simple, pp. 25-26

Electrostatic "pendulum". Sci Teach, Apr. '80, p. 42

Electrostatics demonstration with aluminum coated rubber balloons. In: Giant Handbook, pp. 297-298

Experiment with charged grains. In: Graf, Safe and Simple, pp. 21-22

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The free-wheeling straw - making a straw move inside a bottle without touching the sides. In: Graf, Safe and Simple, pp. 28-29

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How to charge your friends to 10,000 volts. In: Graf, Safe and Simple, pp. 36-37

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Making a static electricity pendulum. In: Graf, Safe and Simple, p. 24

Making electricity with a comb. In: Chapman, Young Scientist, pp. 6-7

Making water wiggle. In: Graf, Safe and Simple, p. 8

Meter determines current in electrostatic circuits. Sci Am, Oct. '73, pp. 123-125, 132

Moving two balloons apart without touching them. In: Goldstein-Jackson, Experiments, pp. 156-157

The obedient ping pong ball - moving the ball with a charged comb. In: Graf, Safe and Simple, p. 8

Pair of "de-shockers" - harmlessly discharge high-voltage electrostatic charges. Pop Elec, Jan. '74, p. 113

Rub for your light - causing a fluorescent tube to glow by rubbing. In: Graf, Safe and Simple, pp. 35-36

Separating salt from pepper without touching them. In: Goldstein-Jackson, Experiments, pp. 158-159

Shielding your electroscope. In: Graf, Safe and Simple, pp. 18-19

Static electricity - how it works. In: Papallo, What Makes It Work, pp. 42-43

Static electricity - simple demonstrations with balloons, combs, etc. In: Amery, KnowHow...Magnets, pp. 4-5

The swinging grain; experiment in static electricity. In: Graf, Safe and Simple, p. 23

Testing the polarity of a variety of liquids using electrostatically charged rods. Sci Teach, Nov. '74, p. 53

Triboelectric or electrostatic series. In: Graf, Safe and Simple, p. 37

Tricks with a comb. In: Graf, Safe and Simple, pp. 5-6

Using the electrophorus. In: Graf, Safe and Simple, pp. 17-18

What is static electricity? Producing static electricity with glass and silk. In: Nelson, Science, p. 119

Wonders of physics that can be found in a cup of coffee or tea - fluid dynamics, electrostatics, pitch of sound, cooling. Sci Am, Nov. '77, pp. 152, 154-158, 160, 164

ELEMENTS, CHEMICAL

See CHEMICAL ELEMENTS; names of specific elements, e.g., HYDROGEN

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Elevator - how it works. In: Papallo, What Makes It Work, pp. 124-125

Elevator (lift). In: Clarke, Encyclopedia of How It Works, pp. 86-88

Mini-elevator. In: Penrose, Dr. Zed's Dazzling, pp. 30-31

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Drawing a perfect ellipse. In: Goldstein-Jackson, Experiments, pp. 142-143
Piet Hein's superellipse. In: Gardner, Mathematical Carnival, pp. 240-254

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An emulsion of oil and water. In: Morgan, First Chemistry Book, pp. 159-162

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ENERGY CONSERVATION
Automotive econometer - solid-state vacuum gauge monitors gas consumption and driving habits. Pop Elec, Feb. '80, pp. 58-60, and correction June '80, p. 6
Check home heat loss with an electronic degree-day meter. Pop Elec, Sept. '80, pp. 85-89, and corrections Apr. '81, p. 6
Energy demand; analyzing data on past energy use. In: Norton, Solar Energy, pp. 91-93
Energy leak detector reveals home heat and cooling losses. Pop Elec, Oct. '78, pp. 59-61
Investigating the amount of electric energy used in your home. Sci Teach, Sept. '83, p. 60
Personal energy consumption; project involving keeping a record of gasoline, electricity, fuel oil, etc., consumed. In: Norton, Solar Energy, pp. 88-90
Thermostatics: proven energy savings - simulated house heating to demonstrate thermostat setback savings. Sci Teach, May '83, pp. 70-71

ENGINES
See also, e.g., ELECTRIC MOTORS; MOTORS; PADDLE WHEELS; PUMPING MACHINERY; SOLAR ENGINES; TURBINES

Make a light engine based on heating and cooling of rubber band spokes of a wheel with a heat lamp. In: Brown, 666 Science Tricks & Expts., p. 60

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How an amateur can construct a model of an enzyme molecule at modest cost. Sci Am, Jan. '76, pp. 124-128, 136

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How does moving air affect our soil? In: Nelson, Science, p. 348

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Escalator. In: Clarke, Encyclopedia of How It Works, pp. 89-90

ETHYLENE GAS
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ETHYLENEDIAMINETETRAACETIC ACID
Titration analysis based on chelate formation - preparation and standardization of EDTA solutions, and determination of calcium and magnesium (including calcium and magnesium in hard water) by this method. In: Skoog, Fundamentals, pp. 737-739 and chapter 13

EUDIOMETER
Homemade eudiometer. Sci Teach, Nov. '74, p. 53

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Demonstrating dehydration of vegetables left exposed to air. In: Penrose, Dr. Zed's Brilliant, pp. 60-61
Do all liquids dry in an equal period of time? Demonstration with water and rubbing alcohol. In: Nelson, Science, p. 56
Does heat make water evaporate faster? In: Nelson, Science, p. 57
Does wind help drying? In: Nelson, Science, p. 59
How does area affect evaporation? In: Nelson, Science, p. 58
Pour rubbing alcohol on one hand and water on the other - which feels cooler, and why? In: Brown, 666 Science Tricks & Expts., p. 290
Various demonstrations of evaporation and condensation. In: Brown, 666 Science Tricks & Expts., pp. 153, 159-160, 162, 167-169, 188-190
What happens to substances in solution when the water evaporates? Evaporation of water from a salt solution. In: Nelson, Science, p. 20

EXPANSION OF GASES
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EXPANSION OF LIQUIDS
How does heat affect liquids? or How can we make a simple thermometer? In: Nelson, Science, p. 70

EXPANSION OF SOLIDS
Hot weight - demonstration to show expansion of a wire on heating and contraction on cooling. In: Brown, 666 Science Tricks & Expts., p. 277
How do heating and cooling change the length of a wire? In: Nelson, Science, p. 69

EXPANSION OF SOLIDS (continued)
How does heat affect solids? Demonstration with a brass expansion ring and a brass expansion ball. In: Nelson, Science, p. 68
Loosening a stuck jar lid by heating. In: Brown, 666 Science Tricks & Expts., p. 289
Proving that metal expands when heated. In: Goldstein-Jackson, Experiments, pp. 98-99
Thermal expansion of metals - an improvised demonstration. Sci Teach, Oct. '81, p. 48
Thermostat device - construction and use; provides example of differential coefficient of expansion of two metals. Sci Teach, Oct. '74, pp. 38-40

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EXPLOSIONS AND EXPLOSIVES
Explosives. In: Clarke, Encyclopedia of How It Works, pp. 90-93
Gas cannon operating with carbon dioxide gas. In: Amery, KnowHow... Experiments, p. 5
Nitrogen triiodide monoammine is formed; very explosive when dry. In: Chen, Entertaining, pp. 67-68
"Pop" bottle - carbon dioxide pressure causes cork to blow out. In: Brown, 666 Science Tricks & Expts., p. 338
Small amount of mixture of potassium chlorate and sulfur produces a loud bang when hit by a hammer. In: Chen, Entertaining, p. 66
Yellow phosphorus and potassium chlorate tablet used to produce explosion. In: Chen, Entertaining, pp. 66-67

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EXTRASENSORY PERCEPTION
Akins, ESP
Build an ESP testing machine. Pop Elec, July '74, pp. 27-32
Test your remote viewing ability. In: Taylor, Kids' Whole Future Catalog, p. 165
Using your "sixth sense": clairvoyance, precognition, telepathy. In: Taylor, Kids' Whole Future Catalog, pp. 112-113

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Don't blink - difficult not to blink when puff of air is directed at the top of the nose. In: Brown, 666 Science Tricks & Expts., p. 136
Experiment for testing eye resolution. Sci Teach, Dec. '81, pp. 20-21
Observation and dissection of a cow's eye. In: Baldini, Student Science Activities, pp. 129-130
Similarity between convex lens and the eye. In: Baldini, Student Science Activities, pp. 128-129
Why do the pupils of our eyes change size? Experiment with a flashlight. In: Nelson, Science, p. 292

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Fat-spot tester - testing for fat by pressing material against absorbent paper. In: Herbert, Mr. Wizard's, p. 42
How do we test food for fat content? This is a test for grease spot formation on a piece of paper. In: Nelson, Science, p. 306
Testing foods for fats. In: Baldini, Student Science Activities, p.116

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Carbon dioxide from fermentation, using yeast. In: Brown, 666 Science Tricks & Expts., pp. 339-340

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FERTILIZATION OF PLANTS
Growing corn from seed, including fertilizing the corn. In: Stein, Science Book, pp. 104-108

FIBER OPTICS
Experimenting with a low-cost fiber-optic link. Computers & Electronics, Feb. '83, pp. 113-114, 116-117
Experimenting with fiber optics. Pop Elec, May '82, pp. 63-68, and correction July '82, p. 6
Fiber optics image guide. In: Wels, Science, pp. 28-29
Fiber optics light guide experiments and variations, using glass or plastic light guide. In: Wels, Science, pp. 27-28
Low-cost fiberoptic transmitter and receiver project. In: Kuecken, Fiberoptics, pp. 351-358
Optical fibre communications. Pop Elec, May '80, pp. 84+, and June '80, pp. 76+, and comment Oct. '80, p. 89
Procedure for constructing a glass fiber optics light guide from unjacketed fibers. In: Wels, Science, pp. 24-26
Procedure for constructing a plastic fiber optics light guide from plastic fibers. In: Wels, Science, pp. 26-27

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Fast cotton - does cotton or polyester fiber absorb water more quickly? A cotton cloth and a permanent-press cloth? In: Brown, 666 Science Tricks & Expts., pp. 281-282

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Fibonacci and Lucas numbers. In: Gardner, Mathematical Circus, pp.152-168

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Infrared radiation filter construction. Sci Am, Mar. '73, pp. 118-119, 128

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Dermatoglyphics: genetics by fingerprint. Sci Teach, Apr. '82, pp.17-19
Fingerprint observation by frustrated total reflection, using laser light. In: Kallard, Exploring, pp. 64-65
Making and collecting fingerprints. In: Penrose, Dr. Zed's Brilliant, pp. 58-59

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Bet you can't drop a penny held between two fingers - demonstration of the interdependence of fingers because of ligament connections. In: Cobb, Bet You Can't, p. 111

FIRE
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Do fires need oxygen? Extinguishing a candle flame by covering the candle with a glass jar. In: Nelson, Science, p. 75
Fire bows; can you start a fire fastest with an Indian fire bow? - experimenting with changing the bow, cord, stick, etc. In: Renner, How to Build, pp. 106-124
Fire on water - pea-sized piece of potassium or sodium on water will produce hydrogen, which ignites from the heat of reaction. In: Chen, Entertaining, p. 50
Fire under water, using potassium chlorate, white phosphorus and concentrated sulfuric acid. In: Chen, Entertaining, pp. 50-51
Fire without matches, using potassium permanganate and glycerine. In: Cherrier, Fascinating...Chemistry, pp. 72-73
Fire writing and drawing, using potassium nitrate solution. In: Chen, Entertaining, p. 52
Fireproof cloth - cloth soaked in a mixture of rubbing alcohol and water remains unburned when the alcohol is ignited. In: Brown, 666 Science Tricks & Expts., pp. 286-287
Fires require oxygen - experiment with a candle in an inverted jar sitting in a pan of water. In: Morgan, First Chemistry Book, pp. 71-77
Magic wet fire, using ethyl rubbing alcohol and water. In: Shalit, Science, pp. 43-44

FIRE ALARMS
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Add a safe, convenient shutoff to smoke detectors. Pop Elec, Jan. '82, p. 68, and correction Mar. '82, p. 8
Clothespin alarms - set-up can be used to make simple fire alarm or rain alarm. In: Herbert, Mr. Wizard's, p. 54
Gas/smoke detector - the Taguchi gas sensor. In: Fox, Unique Electronic, pp. 93-97
Solid state security - various alarm circuits. Pop Elec, Sept. '78, pp. 87-88, 90-91

FIRE EXTINCTION
Bet you can't keep a match burning over a glass of soda! - carbon dioxide extinguishes the flame. In: Cobb, Bet You Can't, pp. 86-87
Carbon dioxide extinguishes fire. In: Morgan, First Chemistry Book, pp. 133-134

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FIRE EXTINCTION (continued)

Carbon dioxide fire extinguisher. In: Tuey, How to Be, pp. 34, 37

Demonstrations involving carbon dioxide production: making a "soda fountain" and a soda fire-fighter. In: Herbert, Mr. Wizard's, pp.18-19

Do fires need oxygen? Extinguishing a candle flame by covering the candle with a glass jar. In: Nelson, Science, p. 75

Dry ice; making a bushel of bubbles with dry ice in soapy water; fighting fire with carbon dioxide (here dry ice is used). In: Morgan, First Chemistry Book, pp. 139-143

How does a fire extinguisher work? Carbon dioxide generation using vinegar and baking soda. In: Nelson, Science, p. 15

How liquid carbon dioxide and dry chemical fire extinguishers work. In: Papallo, What Makes It Work, p. 118

How to make a fire extinguisher using sodium bicarbonate, and aluminum sulphate or tartaric acid. In: Cherrier, Fascinating...Chemistry, p. 89

How to make a mini-pill bottle soda-acid carbon dioxide fire extinguisher. In: Baldini, Student Science Activities, pp. 101-103

Making a carbon dioxide fire extinguisher. In: Penrose, Dr. Zed's Brilliant, pp. 48-49

Making a fire extinguisher using vinegar and baking soda. In: Goldstein-Jackson, Experiments, pp. 124-125

Quench the fire - baking soda on a grease fire releases carbon dioxide. In: Brown, 666 Science Tricks & Expts., p. 314

FIREFLIES

Fireflies - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 163-166

The firefly. In: Headstrom, Your Insect Pet, pp. 84-86, 144

FIREPLACES

Measuring radiation patterns from a fireplace. Sci Am, Aug. '78, pp. 143-146

FIREWORKS

Fireworks and flares. In: Clarke, Encyclopedia of How It Works, pp. 99-101

Improvised fireworks using iron powder or filings. In: Cherrier, Fascinating...Chemistry, p. 72

Preparation of roman candles. In: Cherrier, Fascinating...Chemistry, pp. 59-60

Pyrotechnics in a thimble using potassium nitrate and charcoal. In: Cherrier, Fascinating...Chemistry, pp. 70-71

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FISH TRAPS

Audible electronic fish lure circuitry. In: Friedman, 99 Practical, pp. 120-121

Electronic fish attractor. In: Mendelson, 103 Simple, p. 82

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General suggestions on the study of fish - Japanese fish printing, preparing a fish key as an aid to recognizing fish, investigating fish at the fish market, etc. Sci Teach, Sept. '83, pp. 55-59

Nature vs. nurture - an experiment with fish. Sci Teach, Apr. '75, pp. 41-42

FLAGELLATA
A method to cultivate Euglena. Sci Teach, Jan. '78, p. 32

FLAME
Bet you can't make a flame pass through a strainer! - metal strainer absorbs heat energy of the flame and temperature drops below the kindling point. In: Cobb, Bet You Can't, p. 90
Cold flame, produced by igniting a mixture of carbon tetrachloride and carbon disulfide in a certain ratio. In: Chen, Entertaining, p. 53
Colored flames - shows colors given by different chemicals. In: Cherrier, Fascinating...Chemistry, pp. 68-69
Flames in which air is introduced into a flammable gas. Sci Am, Nov. '79, pp. 192, 194, 197-198, 200, 206
Perpetual green flame by inserting a bottle containing methanol and boric acid in a Bunsen burner gas line. In: Chen, Entertaining, p.89
Physics and chemistry of a candle flame; making and experimenting with different types of candles. Sci Am, Apr. '78, pp. 154-155, 157-160, 162, 164
Sodium light in methyl alcohol flame. In: Brown, 666 Science Tricks & Expts., p. 312

FLAME PHOTOMETRY
See also, e.g., GRAVIMETRIC ANALYSIS (CHEMISTRY); POTENTIOMETRY (CHEMISTRY); VOLUMETRIC ANALYSIS (CHEMISTRY); and other specific chemical analytical methods

Determination of sodium, potassium, and calcium in mineral waters. In: Skoog, Fundamentals, p. 765 and chapter 25

FLAME TESTING (CHEMISTRY)
An alternative method for demonstrating flame tests - holding burner flame in the steam emitted from the mouth of a test tube containing a solution of the salt of an element being boiled to dryness. Sci Teach, Apr. '83, p. 57
Boron flame test using boric acid. In: Brown, 666 Science Tricks & Expts., pp. 364-365
Colored flames - shows colors given by different chemicals. In: Cherrier, Fascinating...Chemistry, pp. 68-69
Demonstration showing spectrum formation from candle or alcohol lamp light passing through a diffraction grating; color effect of adding some common salts (table salt, epsom salts, baking powder) to the flame. In: Simon, How to Be a Space Scientist, pp. 67-68
The flame test. In: Brown, 666 Science Tricks & Expts., p. 365
Magic green flames from boric acid and from copper. In: Shalit, Science, pp. 48-49

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All kinds of food extracts: distillation. In: Cobb, More Science Experiments, pp. 97-100
Beef "tea": extraction of water-soluble meat chemicals. In: Cobb, More Science Experiments, pp. 94-97
Synthetic cola. In: Cobb, More Science Experiments, pp. 100-102
A "tea" party: solubility of flavors - experiments to demonstrate some of the flavors that make delicious drinks and optimum conditions for extracting flavors. In: Cobb, More Science Experiments, pp. 87-89

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Goldenrod gall fly - classification, life cycle, how to find the larva, what you can observe. In: Stokes, Guide, pp. 347-351
Great Redi experiment - experiment with putrefaction of meat and formation of maggots (from fly eggs). In: Brown, 666 Science Tricks & Expts., pp. 142-143
Houseflies - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 248-253
Midges - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 177-182
Robber flies - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 183-187
Syrphid flies - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 188-193

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FLOUR
Burn flour (in the form of fine flour dust). In: Brown, 666 Science Tricks & Expts., p. 337
How to make "space bread" from algae flour. In: Greenleaf, Experiments in Space Science, p. 113

FLOWERS
See also COLOR OF FLOWERS; names of specific flowers, e.g., GERANIUMS, SUNFLOWERS

Bleach flowers. In: Brown, 666 Science Tricks & Expts., pp. 341-343
Flower garden. In: McPhee, Gardening, pp. [16-17]
Indoor gardening projects: bulbs and bulb-like plants - narcissus, miniature tulips, calla lily. In: Millard, Plants for Kids, pp. 65-70, 73-74
Indoor gardening projects: flowering house plants - camellia, geraniums, morning glory vine. In: Millard, Plants for Kids, pp. 75-82
Indoor gardening project: using window boxes to grow vegetables and flowers. In: Millard, Plants for Kids, pp. 34-35, 37-49
Observing parts of a flower, and making a drawing. In: Baldini, Student Science Activities, pp. 149-150

FLUID DYNAMICS
See also AERODYNAMICS

The charm of hydraulic jumps, starting with those observed in the kitchen sink. Sci Am, Apr. '81, pp. 176-178, 178B, 179-180, 182, 184, 186, and addition Sept. '81, p. 224
Circulation patterns in liquids, including investigation of the patterns in Middle Eastern coffee. Sci Am, May '83, pp. 164, 167-170
Demonstrating fluid flow using polarized light, and photographing fluid motion. Sci Am, Feb. '80, pp. 162, 164, 167-168, 170, 172
Demonstration with water and glycerol - this curious demonstration suggests important concepts of viscous fluid flow, liquid diffusion and the nature of reversible reactions. Sci Teach, Jan. '73, p. 42
Forming water into sheets and bells with knives, spoons and other objects. Sci Am, Aug. '79, pp. 188, 191-196, 198

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Pitot tube, to measure the velocity of a fluid. In: Clarke, Encyclopedia of How It Works, pp. 170-171

Serious fun with Polyox, Silly Putty, Slime and other non-Newtonian fluids; making quicksand, shear-thickening fluid from water and cornstarch, etc. Sci Am, Nov. '78, pp. 186, 188, 191-194, 196, 198, and additional comments Feb. '80, p. 170

Smaller water stream directed at larger stream will turn larger stream aside - a "fluidics" demonstration. In: Brown, 666 Science Tricks & Expts., pp. 388-389

Water droplets that float on water. Sci Am, Aug. '73, pp. 104-109, 116

Why honey and syrup form a coil when they are poured, and investigations with other liquids. Sci Am, Sept. '81, pp. 216-217, 219-220, 223-224, 226

Wonders of physics that can be found in a cup of coffee or tea - fluid dynamics, electrostatics, pitch of sound, cooling. Sci Am, Nov. '77, pp. 152, 154-158, 160, 164

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FLUORESCENCE

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Battery-operated fluorescent lamp. Pop Elec, Aug. '81, pp. 53-55, and correction Jan. '82, p. 6

Demonstration of fluorescence by photosynthetic pigments. Sci Teach, Dec. '73, p. 47

Luminescent liquid. In: Cherrier, Fascinating...Physics, p. 64

FLUTE

See MUSICAL INSTRUMENTS

FLYING DISCS (GAME)

Experimenting with a paper-plate frisbee by altering its size, shape, support, weight, etc. In: Renner, How to Build, pp. 36-50

FOCAL LENGTH

Determination of the focal length of a convex lens by autocollimation using laser light. In: Kallard, Exploring, p. 62

How does a camera focus? Simple demonstration using a light source, magnifying glass, and a white surface. In: Nelson, Science, p. 87

Image plane and focal length determination using laser speckle. In: Kallard, Exploring, pp. 172-173

Simple method of obtaining a rough measurement of focal lengths of diverging lenses and mirrors. Sci Teach, Oct. '81, p. 49

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Fogs and mists - simple condensation demonstrations. In: Tuey, How to Be, pp. 12-13

How is fog formed? Forming fog in a milk bottle. In: Nelson, Science, p. 179

Simple apparatus to illustrate the formation of fog. Sci Teach, Jan. '81, p. 38

FOOD

See also, e.g., COLOR OF FOOD; DIGESTION; the various headings beginning with FOOD; GARDENS; NUTRITION; and specific foods, e.g., MILK, POTATOES; classes of foods, e.g., VEGETABLES; and components of foods, e.g., CARBOHYDRATES, FAT

FOOD

FOOD (continued)

How to make "space bread" from algae flour. In: Greenleaf, Experiments in Space Science, p. 113

How to make worm cookies step-by-step; using worms as food, and how worms and other insects measure up as sources of protein. In: Taylor, Kids' Whole Future Catalog, p. 75

Taylor, Entertaining with Insects -- information on how to make food dishes using insects, where to buy insects and how to collect and raise insects on one's own

FOOD - ANALYSIS

See also FAT

The acids in foods - detection with litmus paper. In: Morgan, First Chemistry Book, p. 106

Chemistry in the toaster - toast is tested for starch with iodine; untoasted part gives starch test, toasted part doesn't. In: Brown, 666 Science Tricks & Expts., p. 364

Chocolate pudding: carrageenan stabilization. In: Cobb, More Science Experiments, pp. 75-77

Heat you can eat - laboratory exercise to determine the amount of heat produced by burning a peanut. Sci Teach, May '82, pp. 52-53

The physics and chemistry of a failed sauce bearnaise. Sci Am, Dec. '79, pp. 144-145, 147-150, 162

Physics and chemistry of the lemon meringue pie. Sci Am, June '81, pp. 194, 196-198, 200, 202

Testing food for starch using iodine. In: Baldini, Student Science Activities, p. 115

Testing food for sugar. In: Baldini, Student Science Activities, p. 116

Testing foods for proteins. In: Baldini, Student Science Activities,p.117

Vitamin C hunt. Procedure to tell whether vitamin C is present. In: Cobb, More Science Experiments, pp. 64-69

What foods contain carbohydrates (starches and sugars)? Tests with iodine solution and Benedict's solution. In: Nelson, Science, p.304

What's for lunch? - analysis of a school lunch. Sci Teach, Apr. '83, pp. 48-52

FOOD - COLOR

See COLOR OF FOOD

FOOD - CONTAMINATION

See FOOD CONTAMINATION

FOOD - DRYING

Beef jerky: drying and curing. In: Cobb, More Science Experiments, pp. 46-50

Demonstrating dehydration of vegetables left exposed to air. In: Penrose, Dr. Zed's Brilliant, pp. 60-61

FOOD - FLAVORS

All kinds of food extracts: distillation. In: Cobb, More Science Experiments, pp. 97-100

The artichoke phenomenon - the effect of artichokes on the tongue. In: Cobb, More Science Experiments, pp. 114-118

Beef "tea": extraction of water-soluble meat chemicals. In: Cobb, More Science Experiments, pp. 94-97

MSG - a flavor enhancer: experiment to demonstrate the effect of MSG on food flavor. In: Cobb, More Science Experiments, pp. 83-86

FOOD - FLAVORS (continued)

No clues: Coke versus 7-Up - if a person cannot see the color of the soda, can Coke and 7-Up be confused? In: Cobb, More Science Experiments, pp. 110-112

Smell without taste: artificial strawberry 'flavoring'. In: Cobb, More Science Experiments, pp. 105-106

Sweetening melons - investigating flavor potentiation. Effect of salt on sweetness. In: Cobb, More Science Experiments, pp. 112-114

Synthetic cola. In: Cobb, More Science Experiments, pp. 100-102

Taste without smell: apple versus potato versus onion. In: Cobb, More Science Experiments, pp. 106-109

A "tea" party: solubility of flavors - experiments to demonstrate some of the flavors that make delicious drinks and optimum conditions for extracting flavors. In: Cobb, More Science Experiments, pp. 87-89

Tea to a T: temperature for the "perfect" infusion - experiment to determine if temperature and boiling time of water have an effect on tea taste. In: Cobb, More Science Experiments, pp. 90-93

FOOD - PRESERVATION

See also FOOD - DRYING

Beef jerky: drying and curing. In: Cobb, More Science Experiments, pp. 46-50

Canned fruits and vegetables: high-acid versus low-acid goods. In: Cobb, More Science Experiments, pp. 56-61

Canning of food. In: Clarke, Encyclopedia of How It's Made, pp. 27-32

Experiment comparing boiled with unboiled juice - unboiled juice will sour and/or mold. In: Brown, 666 Science Tricks & Expts., pp. 127-128

Sautéed mushrooms: dehydration and reconstitution. In: Cobb, More Science Experiments, pp. 50-52

Vitamin E as an antioxidant. In: Cobb, More Science Experiments, pp.72-74

Zucchini: freezing and thawing. In: Cobb, More Science Experiments, pp. 52-56

FOOD ADDITIVES

Chocolate pudding: carrageenan stabilization. In: Cobb, More Science Experiments, pp. 75-77

Food coloring: natural versus artificial. Experiment to determine whether artificial coloring made from coal tar has been used in a food. In: Cobb, More Science Experiments, pp. 80-83

Identifying food dyes by chromatography. Sci Teach, Nov. '79, pp. 37-39

MSG - a flavor enhancer: experiment to demonstrate the effect of MSG on food flavor. In: Cobb, More Science Experiments, pp. 83-86

Product labels - ingredients for chemistry study; project involving collecting and examining labels listing ingredients of various manufactured products. Sci Teach, Dec. '81, pp. 28-30

Vitamin C versus oxygen - vitamin C added to foods to interfere with color changes. Experiment to demonstrate this effect of the vitamin. In: Cobb, More Science Experiments, pp. 69-72

Vitamin E as an antioxidant. In: Cobb, More Science Experiments, pp. 72-74

Whipped topping: acid-stabilized foam. In: Cobb, More Science Experiments, pp. 77-80

FOOD CONTAMINATION

Canned fruits and vegetables: high-acid versus low-acid foods. In: Cobb, More Science Experiments, pp. 56-61

FORAMINIFERA

FORAMINIFERA

Discovering foraminifers on ancient and modern beaches; collecting the microfossils, manipulation and mounting. Sci Teach, Oct. '77, pp. 44-45

FORCE AND ENERGY

See also, e.g., CENTRIFUGAL FORCE; CENTRIPETAL FORCE; INERTIA (MECHANICS); MASS (PHYSICS); MOMENTUM (MECHANICS); MOTION; POWER (MECHANICS); SOLAR ENERGY; TORQUE; WORK (MECHANICS); and other related headings

Bet you can't outpull a book! - string supporting book cannot be pulled into perfectly horizontal position. In: Cobb, Bet You Can't, p. 24

A blow with a stick - stick supported on wine glasses which do not break when stick is struck, etc. In: Lanners, Secrets, pp. 51-52

Breaking either one of two strings. In: Goldstein-Jackson, Experiments, pp. 88-89

Collection of demonstrations and tricks involving various applications of force. In: Cobb, Bet You Can't, pp. 27-42

Cutting a potato with paper - paper-wrapped knife blade will cut the potato, but won't cut the paper. In: Goldstein-Jackson, Experiments, pp. 82-83

Demonstrating the strength of an eggshell. In: Goldstein-Jackson, Experiments, pp. 86-87

Demonstrations of different forms of energy and their ability to change form - electrical, atomic, mechanical, chemical, heat, light, radio waves. In: Rosenfeld, Science, pp. 77-89, 168

The difficult feat of crushing an egg in your hand. In: Herbert, Mr. Wizard's, p. 40

Do you dare? Demonstration with a pendulum to show the law of conservation of energy. In: Brown, 666 Science Tricks & Expts., pp. 80-81

Down a hill, up a hill - experiment involving rolling a marble or ball on a curved sheet of cardboard. In: Gardner, Moving Right Along, pp. 56-57

Egg drops; from how high can you drop an egg without breaking it? - altering the carton containing the egg, altering the egg size, weight, etc., changing shock absorbers, etc. In: Renner, How to Build, pp.52-76

Experiment with forces causing a pencil point to break. Sci Am, Feb. '79, pp. 162-164, 168

Experimenting with the potential and kinetic energy of a pendulum. Sci Teach, Oct. '73, p. 31

Holding a matchstick so it cannot be broken. In: Goldstein-Jackson, Experiments, pp. 104-105

Inverse square relationship - an experiment using an electromagnet. Sci Teach, Mar. '75, pp. 53-55, and comments May '75, pp. 4-5

Making a cord impossible to pull straight. In: Goldstein-Jackson, Experiments, pp. 90-91

Measuring rocket power (thrust): experiment with a kitchen scale, a plastic bottle and cork, vinegar and bicarbonate of soda. In: Simon, How to Be a Space Scientist, pp. 10-11

Physics of the follow, the draw and the massé (in billiards and pool). Sci Am, July '83, pp. 124-130

Propagation of shocks - demonstration with a number of ball bearings. In: Cherrier, Fascinating...Physics, pp. 46-48

Returnable can - twisted rubber bands store energy and cause can to roll back. Sci Teach, Oct. '82, pp. 50-51

FORCE AND ENERGY (continued)

Rolling marble - demonstration that potential energy of an object depends on height. In: Brown, 666 Science Tricks & Expts., p. 399

Rolling several objects down an incline to demonstrate the relative importance of translational and rotational kinetic energies for various objects. In: Brown, 666 Science Tricks & Expts., p. 400

Thinking about physics while scared to death (on a falling roller coaster) - the physics of amusement park rides. Sci Am, Oct. '83, pp. 162-164, 167-170

The transfer of energy: the principle of and how to make your own Newton's Cradle. In: Richards, Science Magic, pp. 8-9

The transmission of an impact. In: Lanners, Secrets, pp. 52-53

Wilberforce pendulum - provides excellent demonstration of energy transformations. Sci Teach, Apr. '74, p. 46

Will a knot hold or slip? - mathematical analysis of forces involved. Sci Am, Aug. '83, pp. 120, 123-128

Your first launch: experiments with falling objects and with Newton's Second Law. In: Simon, How to Be a Space Scientist, pp. 4-5

FORMALDEHYDE

Chemical color reaction: formaldehyde clock reaction. In: Chen, Entertaining, pp. 28-30

Home is where the formaldehyde is - two experiments showing that the same chemical that pickles frogs in the lab pollutes one's living room. Sci Teach, Dec. '83, pp. 26, 28-29

FOSSILS

Discovering foraminifers on ancient and modern beaches; collecting the microfossils, manipulation and mounting. Sci Teach, Oct. '77, pp. 44-45

How to make a great (geological) impression - methods for obtaining impressions of fossils. Sci Teach, Nov. '81, pp. 41-42

Stalking the fossil trilobite, crinoid and seed fern in Ohio, with tips on handling of fossils. Sci Am, Mar. '80, pp. 184-186, 188, 190-192, 194

FOUCAULT'S PENDULUM

See also EARTH - ROTATION

Cold pendulum on a turning earth. In: Gardner, Moving Right Along, pp. 116-119

Foucault pendulum demonstrator. Sci Teach, May '78, p. 43

Foucault's pendulum experiment and related activities to demonstrate relative motion and earth's rotation. In: Rosenfeld, Science, pp. 15-25, 166

Foucault's pendulum (I and II). In: Brown, 666 Science Tricks & Expts., pp. 393-394

Table-top Foucault pendulum. Sci Teach, Dec. '79, pp. 34-35, and addition Apr. '80, p. 16

FOUNTAINS

Ammonia or hydrogen chloride gas fountain (carbon dioxide gas or sulfur dioxide gas can also be used with slight modification). In: Chen, Entertaining, pp. 75-76

Bottle fountain - fountain sprays when bottle is immersed in hot water. In: Amery, KnowHow...Experiments, p. 7

Constructing a fountain using an electric pump. In: Wels, Science, pp. 81-84

FOUNTAINS

FOUNTAINS (continued)

The luminous fountain,using laser light. In: Kallard, Exploring, p. 64

Salt fountain, inverted glass trick, and other curiosities based on different densities of fluids. Sci Am, Oct. '77, pp. 142, 144-145, 147, 152, and further comments Oct. '78, p. 187

FREEFALL

See ACCELERATION (MECHANICS)

FREEZING

See also FREEZING POINTS; FROST; FUSION, LATENT HEAT OF; ICE; MELTING; PLANTS, EFFECT OF TEMPERATURE ON; REFRIGERATION AND REFRIGERATING MACHINERY

Can a liquid be changed to a solid? In: Nelson, Science, p. 5

Freezing - experiment with olive oil to show that the oil freezes from the bottom, whereas water ice floats. In: Brown, 666 Science Tricks & Expts., pp. 278-279

Freezing of plant tissue. In: Brown, 666 Science Tricks & Expts., p.112

Freezing of water and paraffin - expansion or contraction? In: Brown, 666 Science Tricks & Expts., p. 289

Freezing your finger to an ice cube. In: Brown, 666 Science Tricks & Expts., p. 285

Hot water freezes faster than cold water; experiments on freezing water. Sci Am, Sept. '77, pp. 246, 248, 250, 252, 257, 262

Making a column of ice - a demonstration that shows that water expands on freezing. In: Goldstein-Jackson, Experiments, pp. 36-37

When water freezes does it expand or contract? In: Nelson, Science, p.55

FREEZING POINTS

See also FREEZING; MELTING POINTS

How cold does ice get? Demonstration showing the effect of salt on the freezing point of water. In: Nelson, Science, p. 53

Ice and salt - salt lowers the freezing point of ice. In: Brown, 666 Science Tricks & Expts., pp. 353-354

Ice cube lifting trick using salt to lower the freezing point of ice. In: Herbert, Mr. Wizard's, p. 24

Mystery ice - demonstration with a bottle of soft drink; also demonstration of expansion of water on freezing. In: Brown, 666 Science Tricks & Expts., pp. 274-275

Old freezing question - in what order do boiled water, aerated water and salt water freeze. In: Brown, 666 Science Tricks & Expts., pp. 275-276

FREQUENCIES OF OSCILLATING SYSTEMS

Frequency indicator circuit designed to monitor a single frequency tone. Pop Elec, Feb. '74, pp. 103-104

FREQUENCY CHANGERS

Mobile shortwave converter enables tuning across standard auto AM radio dial to hear radio stations around the world. In: Mendelson, 103 Simple, pp. 63-64

FREQUENCY CHANGERS (continued)

Ship-to-shore SW converter allows tuning of 2- and 3-MHz marine band on car or home radio. In: Mendelson, 103 Simple, pp. 50-51

Shortwave converter for any AM radio. Pop Elec, Jan. '82, pp. 65+

Two-meter converter. In: Mendelson, 103 Simple, pp. 124-125

x100 frequency multiplier. Pop Elec, Sept. '80, p. 128

FREQUENCY METERS

Audio frequency meter. In: Carr, 104 Weekend, pp. 165-169

Audio-frequency meter - four ranges from 5Hz to 5kHz. Pop Elec, July '75, pp. 45-46

Build a low-cost 1-Hz to 1-MHz frequency counter. Pop Elec, Aug. '76, pp. 48-49

Build a 10-Hz to 1-MHz EPUT meter - a frequency counter. Pop Elec, Mar. '77, pp. 68-69, and correction June '77, p. 6

Digital phase meter (zero beat meter II). In: Carr, 104 Weekend, p.119

40-MHz frequency counter. Pop Elec, June '77, pp. 64-66

Frequency deviation meter. Pop Elec, Aug. '73, p. 96

Zero-beat meter (I). In: Carr, 104 Weekend, pp. 117-119

000-to-999 event counter. Computers & Electronics, Dec. '82, p. 124

FREQUENCY STANDARDS

Build a deluxe frequency standard - useful for shortwave radio tuning. Pop Elec, Jan. '74, pp. 80-82, and additional comment June '74, p. 9

100kHz/1MHz frequency standard. In: Mendelson, 103 Simple, pp. 44-45

FRESNEL LENS

See LENSES

FRICTION

See also TRIBOLUMINESCENCE

Can electricity be produced by friction? In: Nelson, Science, p. 120

Demonstrations of friction and the importance of friction to space vehicles passing through the atmosphere. In: Simon, How to Be a Space Scientist, pp. 25-26

Experiments with and demonstrations comparing rolling jars, one partially filled with water and one empty; dragging and rolling jars of sand; spinning pencils; etc. In: Brown, 666 Science Tricks & Expts., pp. 381-383, 386, 389-391

Fire bows; can you start a fire fastest with an Indian fire bow? - experimenting with changing the bow, cord, stick, etc. In: Renner, How to Build, pp. 106-124

How can sound be produced by friction? In: Nelson, Science, p. 102

Magic broomstick trick involving balance and friction. In: Shalit, Science, pp. 92-93

Rubbing and warming; slipping and gripping - demonstrations of friction and its effects. In: Amery, KnowHow...Experiments, pp. 22-23

Two frictions - demonstrations with a piece of wire. In: Brown, 666 Science Tricks & Expts., p. 274

FRISBEE (REGISTERED TRADEMARK)

See FLYING DISCS (GAME)

FROGS

FROGS
See also TOADS

Fly and worm farms - how to raise fruit flies and meal worms to feed terrarium animals such as tree frogs, salamanders, baby snakes, and toads. In: Stein, Science Book, pp. 24-25
Frog tadpoles, as pets in a jar. In: Simon, Pets, pp. 39-43, 90-91
How do tadpoles become frogs? General suggestions for a classroom project. In: Nelson, Science, p. 258
Polliwogs in the scheme of things - some ideas for projects on the ecological effects of tadpoles and frogs. Sci Teach, Sept. '77, pp. 16-17

FROST
See also FREEZING; ICE

Physics of the patterns of frost on a window. Sci Am, Dec. 80, pp. 231, 246

FRUIT
See also CITRUS FRUITS; names of specific fruits, e.g., APPLE

A cherry close up. Drawings of cross-sections of a cherry blossom and various other stages of development through to the ripe cherry. In: Stein, Science Book, pp. 88-89
Make your own sun-dried fruit. In: Taylor, Kids' Whole Future Catalog, p. 210

FRUIT - RIPENING
How to ripen a tomato with an apple. In: Stein, Science Book, p. 221
Ripening fruit. In: Cobb, More Science Experiments, pp. 19-23

FRUIT FLIES
Fly and worm farms - how to raise fruit flies and meal worms to feed terrarium animals such as tree frogs, salamanders, baby snakes, and toads. In: Stein, Science Book, pp. 24-25
The fruit fly. In: Headstrom, Your Insect Pet, pp. 130-132, 147
Phototropism in animals - fruit flies and yellow mealworms. Sci Teach, Nov. '79, p. 39

FUEL
See also, e.g., CHARCOAL; COAL; COKE; GASOLINE; WOOD

Digital fuel gauge. Pop Elec, Dec. '76, pp. 59-62

FUNGI
See MOLDS (BOTANY); YEAST

FURNACES
See also SOLAR HEATING

Clogged-filter and system-trouble alarm for a home furnace. In: Fox, Unique Electronic, pp. 100-103
Furnace. In: Clarke, Encyclopedia of How It Works, pp. 105-109

FUSES
See ELECTRIC FUSES

FUSION, LATENT HEAT OF
See also FREEZING; MELTING

Bet you can't raise the temperature of ice water by heating it! - temperature of ice water remains the same until the ice is melted. In: Cobb, Bet You Can't, p. 96
Determining the latent heat of a substance - experiment using ice; to measure the effect of incoming solar radiation on the rate of melting ice. In: Norton, Solar Energy, pp. 16-19
Icy temperature - demonstrations that when ice is melting or water is boiling, the temperature of the ice or water remains constant until the ice has melted or the water has boiled. In: Brown, 666 Science Tricks & Expts., p. 282
Will water temperature rise if water is heated while it has ice in it? In: Nelson, Science, p. 72

GAGES
See ELECTRONIC GAGES

GALLS (BOTANY)
The oak gall - observation, collection, chemistry. In: Baldini, Student Science Activities, pp.190-194

GALVANOMETER
How to make a current detector (galvanoscope). In: Graf, Safe and Simple, pp. 75-76
How to make a galvanoscope. In: Morgan, Adventures in Electrochemistry, pp. 237-239
Money power - producing an electric current using wet blotters, dimes and pennies, and detecting the current with a simple galvanometer. In: Brown, 666 Science Tricks & Expts., pp. 205-206

GALVANOSCOPE
See GALVANOMETER

GAMES
See also ELECTRONIC GAMES; MATHEMATICAL RECREATIONS

Electric light answer quiz game. In: Amery, KnowHow...Magnets, pp. 20-21
Electric quiz board of chemical elements and their symbols. In: Baldini, Student Science Activities, pp. 22-23, 90
Electronic scorekeeper for recreation rooms. Pop Elec, Oct. '79, pp. 74-75, and correction June '80, p. 6
Game involving trying to drop a small screw or nail, held up by an electromagnet, into a swinging tray by turning off the magnet at the right moment. In: Amery, KnowHow...Magnets, pp. 44-45
"Go Vector": a physics game. Sci Teach, Mar. '74, pp. 42-43
How to make an electric quiz board. In: Baldini, Student Science Activities, pp. 22-23
Physics of the follow, the draw and the massé (in billiards and pool). Sci Am, July '83, pp. 124-130
Pin ball game, involving electric circuits. In: Amery, KnowHow...Magnets, pp. 30-31

GAMES

GAMES (continued)

Simple game using a swinging electromagnet - which number will the paper clip fall on when the electromagnet is switched off? In: Amery, KnowHow...Magnets, p. 41

Simple tricks and games with magnets - paper clip tricks, magnetization of needles, boat racing games, etc. In: Amery, KnowHow...Magnets, pp.6-9

Spinning number wheel game, using an electromagnet. In: Amery, KnowHow... Magnets, p. 46

Steady hand game, involving trying not to touch two wires to avoid completing an electrical circuit. In: Amery, KnowHow...Magnets, pp.24-25

Track the invisible wires - game involving completing electrical circuits to light bulbs. In: Amery, KnowHow...Magnets, pp. 26-27

A variety of two-person games for which mathematical strategies are known. In: Gardner, Mathematical Carnival, pp. 208-225

Wriggly road game - car is steered over non-conducting material with a magnet and if it runs off course the circuit is completed and a bulb lights up. In: Amery, KnowHow...Magnets, pp. 18-19

GARAGES

Automatic garage door closer. Pop Elec, Mar. '79, pp. 69-71, and corrections July '79, p. 6 and Oct. '79, p. 8, and comment June '79, p. 6

GARBAGE

See REFUSE AND REFUSE DISPOSAL

GARDENING

See GARDENS

GARDENS

See also GREENHOUSES; HYDROPONICS; TERRARIUMS; VIVARIUMS

Flower garden. In: McPhee, Gardening, pp. [16-17]

Herda, Vegetables in a Pot -- includes information on selection of containers, selection of seeds, preparing soil, planting, light, water, humidity and temperature, and suggested varieties of vegetables for growing

How to plant a seed; how to transplant a seedling. In: Stein, Science Book, pp. 101-103

Indoor gardening project: a dish garden. In: Millard, Plants for Kids, pp. 50-52, 55-61

Indoor gardening project: avocado tree. In: Millard, Plants for Kids, pp. 18, 22-26

Indoor gardening project: beet tops. In: Millard, Plants for Kids, pp. 14-17

Indoor gardening project: citrus orchard. In: Millard, Plants for Kids, pp. 31-32

Indoor gardening project: grow carrot "ferns". In: Millard, Plants for Kids, pp. 12-13, 17

Indoor gardening project: herbs to eat. In: Millard, Plants for Kids, pp. 62-64

Indoor gardening project: rock garden in a basin or wash tub. In: Millard, Plants for Kids, pp. 112-114

Indoor gardening project: sweet potato vines. In: Millard, Plants for Kids, pp. 18-21

Indoor gardening project: using window boxes to grow vegetables and flowers. In: Millard, Plants for Kids, pp. 34-35, 37-49

Indoor gardening projects: basic directions - light, water, soil, food, containers. In: Millard, Plants for Kids, pp. 27-30

GARDENS (continued)

Indoor gardening projects: bulbs and bulb-like plants - narcissus, miniature tulips, calla lily. In: Millard, Plants for Kids, pp. 65-70, 73-74

Indoor gardening projects: cacti and other succulents; iceplant, Indian corncob. In: Millard, Plants for Kids, pp. 94-99

Indoor gardening projects: flowering house plants - camellia, geraniums, morning glory vine. In: Millard, Plants for Kids, pp. 75-82

Indoor gardening projects: foliage plants - piggyback plant, Chinese evergreen, papyrus. In: Millard, Plants for Kids, pp. 83-88, 90-93

Johnsen, Gardening without Soil -- how to set up different kinds of no-soil gardens, how to make plant food and soilless growing mixtures, etc.

McPhee, Gardening... -- includes information on garden plots and pots, pumpkins, trees, bulbs, potatoes, flower gardens, mushrooms, tomatoes, seeds, sunflowers, climbing beans, a water garden, and geraniums

Mintz, Vegetables in Patches and Pots -- book of mini-farming ideas

Miscellaneous ideas for indoor gardening - grow carnivorous plants, bonsai, miniature plants in egg cups or teacups, make a water garden. In: Millard, Plants for Kids, pp. 115-120

Moss garden in a dish. In: Millard, Plants for Kids, pp. 60-61

Sponge garden - sponge is an ideal surface on which to grow seeds. In: Herbert, Mr. Wizard's, p. 56

Water garden, for water lilies, water weeds, water snails and small fish. In: McPhee, Gardening, pp. [28-29]

GASES

See also, e.g., BOILING; BOILING POINTS; CONDENSATION; EVAPORATION; DIFFUSION; VAPORIZATION, HEATS OF; names of specific gases, e.g., HYDROGEN; and other related headings

Air, air pressure & gases: various demonstrations, including constructing a sodastraw atomizer, balloon demonstrations, Bernoulli Law trick, and others. In: Brown, 666 Science Tricks & Expts., pp. 238-272

Can a solid be make to change to a liquid? A liquid to a gas? In: Nelson, Science, p. 4

Diffusion of gases - a simple qualitative study. Sci Teach, Apr. '83, p. 56

Does heat affect gases? Demonstration of expansion and contraction. In: Nelson, Science, p. 67

Experiments to demonstrate the need for and function of a space suit in outer space - demonstrations involving gases dissolved in liquids, the boiling point of water at reduced pressure, insulation against heat, etc. In: Rosenfeld, Science, pp. 91-99, 169

"Flick your BIC": a gas experiment. Sci Teach, Apr. '79, pp. 42-43 and comments Sept. '79, p. 12

Gas law experiments - Boyle's and Charles' Laws. Sci Teach, Apr. '76, pp. 26-27

Hot or cold - effect on the temperature of breath of blowing through a widely open mouth and through pursed lips. In: Brown, 666 Science Tricks & Expts., p. 278

Lighting a candle without touching it - this demonstration shows the reignition of a just-extinguished candle by holding a lighted match near the wick. In: Goldstein-Jackson, Experiments, pp. 112-113

Models for illustrating the states of matter. Sci Teach, Feb. '74, p.48

Reflections on the rising bubbles in a bottle of beer. Sci Am, Dec. '81, pp. 172-174, 176, 186, and correction and addition Oct. '82, pp. 190, 192

The scientific model and the gas laws: investigations of Boyle's Law, Charles's Law and effect of number of particles. Sci Teach, Feb. '73, pp. 55-56, and comment May '73, p. 4

GASES

GASES (continued)
Squeeze bottle - warming bottle with hands causes dime to bounce on opening. In: Brown, 666 Science Tricks & Expts., pp. 276-277
What are the three states of matter? In: Nelson, Science, p. 2
What is condensation? In: Nelson, Science, p. 6
When a candle burns; a candle is a miniature gas factory; the gas in a candle flame; the carbon and the water in a candle flame. In: Morgan, First Chemistry Book, pp. 75-80

GASES - ANALYSIS
See also EUDIOMETER

Alarm for toxic gases. Pop Elec, Sept. '81, pp. 79-80, and correction Feb. '82, p. 12
Gas/smoke detector - the Taguchi gas sensor. In: Fox, Unique Electronic, pp. 93-97
Improved gas and fume detector. Pop Elec, Aug. '76, pp. 46-47, and corrections Nov. '76, p. 6, and Jan. '77, pp. 6, 8
Low-cost smoke and/or gas detector. In: Giant Handbook, pp. 344-345
Poisoned air detector - low-cost sensor sounds alarm with as little as 50ppm of most toxic gases. Pop Elec, Feb. '74, pp. 55-56
Portable gas leak meter. Pop Elec, Aug. '79, pp. 41-42
Using a Michelson-type interferometer, using laser light, to measure the index of refraction of a gas. In: Kallard, Exploring, pp. 140-143

GASES - DENSITY
Is carbon dioxide heavier than air? In: Nelson, Science, p. 76

GASOLINE
Automotive econometer - solid-state vacuum gauge monitors gas consumption and driving habits. Pop Elec, Feb. '80, pp. 58-60, and correction June '80, p. 6

GAUGES
See ELECTRONIC GAGES

GEIGER COUNTERS
See GEIGER-MÜLLER COUNTERS

GEIGER-MÜLLER COUNTERS
Experimenting with a Geiger counter. Computers & Electronics, Sept. '83, pp. 93-94
Geiger counter. In: Clarke, Encyclopedia of How It Works, pp. 113-114

GELATIN
Demonstrating static electricity using a balloon and gelatin to make gelatin stalagmites. In: Herbert, Mr. Wizard's, p. 21
Gelatin and egg. In: Brown, 666 Science Tricks & Expts., p. 327
Tannic acid is used in making leather; demonstration of the effect of tannin upon gelatin. In: Morgan, First Chemistry Book, pp. 107-111

GELS
See COLLOIDS

GENERATORS, AUDIO
See GENERATORS, ELECTRONIC

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Alternating current generator - how it works. In: Papallo, What Makes It Work, p. 129
Generator. In: Clarke, Encyclopedia of How It Works, pp. 114-116
Generator demonstrator. In: Giant Handbook, pp. 121-126

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Audio function generator. In: Carr, 104 Weekend, p. 238
Audio square wave generator. In: Carr, 104 Weekend, pp. 234-237
Basic function generator. Pop Elec, Feb. '74, pp. 103-104
Basic tone generator using the 555 IC timer. Pop Elec, July '74, pp. 50-51
Build a low-cost white/pink noise generator. Pop Elec, Feb. '80, pp. 67+
Build a low-distortion low-cost audio generator. Pop Elec, Jan. '77, pp. 59-60
Build a pink noise generator for audio testing. Pop Elec, July '77, p.66
Build an audio sweep marker generator. Pop Elec, Oct. '75, pp. 71-73
Build the super audio sweep generator. Pop Elec, Oct. '73, pp. 29-34
Electronic pseudorandom number generators. Pop Elec, Dec. '79, p. 98, and comment Mar. '80, p. 6, and additional article Apr. '80, p. 94
Electronic tone generator, constructed with a transistor. In: Malcolm, How to Build Electronic Projects, pp. 105-107
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Experimenting with noise - making electronic noise generators. Pop Elec, Mar. '80, pp. 80-82, and comments Nov. '80, p. 9 and Nov. '81, pp.91-92
Fully adjustable pulse generator. Pop Elec, July '82, p. 90
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I-F signal generator. In: Friedman, 99 Practical, pp. 108-109
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Logic level generator circuit. Pop Elec, Mar. '75, p. 81
Low-cost dot/bar generator - inexpensive color-TV servicing instrument. Pop Elec, Sept. '78, pp. 78-79
Low-cost IC signal generator: audio and 455 kHz rf from a single IC. Pop Elec, Mar. '73, p. 34
Low-frequency sawtooth generator circuit. Pop Elec, July '76, p. 30
Modulator for output of rf oscillators and generators. In: Friedman, 99 Practical, pp. 111-112
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Precision CMOS clock generator. Pop Elec, Sept. '81, p. 104
Programmable function generator. Computers & Electronics, Feb. '83, pp. 85-86, 88, 90-92, and addition July '83, p. 7
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Signal injector - circuit for multivibrator producing frequencies as high as 14MHz. In: Friedman, 99 Practical, pp. 110-111

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GENERATORS, ELECTRONIC (continued)

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Sine-wave squarer - square-wave generator. In: Friedman, 99 Practical, pp. 104-105

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TTL sequence generator with many practical applications. Pop Elec, Feb. '76, pp. 101-102

A three-way tone generator from a code practice oscillator. In: Friedman, 99 Practical, pp. 56-57

Tone-burst generator using a dual timer. Pop Elec, May '74, p. 83

Triangle waveform generator. Pop Elec, May '74, pp. 88-89, with additional comments Oct. '74, p. 7

Tri-function generator and its use; can produce a variable amplitude square wave, a triangle wave and a sine wave output with a frequency range of 1 - 100kHz. In: Giant Handbook, pp. 468-471, 473

Two pitch generators. Pop Elec, Oct. '73, p. 37

Universal tri-state tone generator. Pop Elec, Oct. '79, p. 113

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Wide-range function generator circuit with power supply. Pop Elec, Aug. '77, pp. 72-76

Wide-range pulse generator using a 555 IC timer chip. Pop Elec, Jan. '74, p. 75

Wideband noise generator. Pop Elec, Dec. '76, p. 28

GENERATORS, PULSE

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GENERATORS, SAWTOOTH

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GEOMETRY

See also, e.g., ANGLE; CIRCLE; CONIC SECTIONS; CUBE; CURVES; ELLIPSE; HEXAGON; MÖBIUS STRIP; PARABOLA; RECTANGLE; SPHERE; SQUARE; TOPOLOGY; TRIANGLE

Geometric forms in chemistry. Sci Teach, Sept. '81, pp. 26-31

How to trisect an angle. In: Gardner, Mathematical Carnival, pp. 255-265

Magic stars and polyhedrons. In: Gardner, Mathematical Carnival, pp.55-65

Mascheroni constructions (compass-only constructions and problem solutions), and some match-stick geometry. In: Gardner, Mathematical Circus, pp. 216-231

Mrs. Perkin's quilt and other square-packing problems. In: Gardner, Mathematical Carnival, pp. 139-149

Penny puzzles - geometric problems. In: Gardner, Mathematical Carnival, pp. 12-26

Puzzles about shapes. In: Gardner, Aha!, pp. 31-57

Red-faced cube, and other mathematical (mainly geometrical) puzzles. In: Gardner, Mathematical Carnival, pp. 103-122

Tube puzzle - what was the original shape of cardboard which was made into a spiral paper tube? In: Herbert, Mr. Wizard's, p. 74

GEOTROPISM
Geotropism - plant roots grow downward, responding to gravity. In: Brown, 666 Science Tricks & Expts., pp. 139-140
How roots respond to gravity. In: Baldini, Student Science Activities, pp. 160-161
In which direction do roots grow? In: Nelson, Science, p. 216
Upsidedown roots - experiment in the direction of root growth. In: Penrose, Dr. Zed's Brilliant, pp. 52-53
Watch roots grow in a jar; what happens if the jar is inverted. In: Brown, 666 Science Tricks & Expts., p. 133

GERANIUMS
Geraniums. In: McPhee, Gardening, pp. [30-31]

GERMINATION
Demonstration that germinating seeds give off carbon dioxide gas. In: Baldini, Secret Science Activities, pp. 158-159
How do seeds change into plants? Experiment involving staggered planting of seeds over several weeks. In: Nelson, Science, p. 222
How do we test seeds for germination? In: Nelson, Science, p. 212
How does air affect germination? In: Nelson, Science, p. 214
How does light affect germination? In: Nelson, Science, p. 215
How does water affect germination? In: Nelson, Science, p. 213
Jar germinator. In: Herbert, Mr. Wizard's, p. 33
Magnetobiology: investigations of magnetism and plant growth. Sci Teach, May '73, pp. 57-60
Making and using a seed germination tester. In: Penrose, Dr. Zed's Brilliant, pp. 10-11
Methods of germinating seeds - plant greenhouses, beaker germination, glass plate germination. In: Baldini, Student Science Activities, pp. 155-157
Observing root hairs. In: Brown, 666 Science Tricks & Expts., pp. 143-144
Practical magnetotropism experiment. Sci Teach, Jan. '73, pp. 43-45
Sprouting of a bean (including diagrams). In: Millard, Plants for Kids, p.33
Upsidedown roots - experiment in the direction of root growth. In: Penrose, Dr. Zed's Brilliant, pp. 52-53

GIANT WATER BUGS (INSECTS)
Water bugs of various kinds, as pets in a jar. In: Simon, Pets, pp. 34-38, 90-91

GLASS
Glass. In: Clarke, Encyclopedia of How It's Made, pp. 73-79
Light-sensitive glass. In: Clarke, Encyclopedia of How It Works, pp. 138-139
Refractive index of liquids: inexpensive way to illustrate the laws of refraction and to determine the refractive index of glass and other substances. Sci Teach, Nov. '82, p. 54

GLASS BLOWING AND WORKING
Grinding glass by hand. Sci Am, Aug. '78, pp. 140-143, 148
How do we break glass tubing safely? In: Nelson, Science, p. 61
How to make round bottom flasks, cupels, crystallizers, measuring glasses, etc. In: Cherrier, Fascinating...Chemistry, pp. 10-11
Lens grinding. In: Clarke, Encyclopedia of How It's Made, pp. 93-95

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GLASS BLOWING AND WORKING (continued)
Procedure for constructing a glass fiber optics light guide from unjacketed fibers. In: Wels, Science, pp. 24-26

GLAUBER'S SALT
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GLOBES, CELESTIAL
Do-it-yourself celestial sphere from colored straws. Sci Teach, May '82, p. 47

GLUE
Casein glue from milk. In: Herbert, Mr. Wizard's, p. 36

GLUTEN
Demonstrations of the properties of gluten: making a flour paste, using rye bread as a wallpaper cleaner, and modelling clay made from dough. In: Herbert, Mr. Wizard's, p. 20

GLYCEROL
Demonstration with water and glycerol - this curious demonstration suggests important concepts of viscous fluid flow, liquid diffusion and the nature of reversible reactions. Sci Teach, Jan. '73, p.42
Quantitative analysis for glycerol using periodate oxidation method. In: Skoog, Fundamentals, pp. 354-357 and 751-752

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See also SUNDIALS

How to build a gnomon and how to use it to find the sun's altitude at various times of the year. In: Greenleaf, Experiments in Space Science, pp. 88-91
How to find your latitude anywhere at any time during the year using a homemade gnomon. In: Greenleaf, Experiments in Space Science, pp. 88, 97
How to find your latitude at the time of the equinoxes, Sept. 23 and March 21, using a homemade gnomon. In: Greenleaf, Experiments in Space Science, pp. 88, 95
How to find your latitude at the time of the winter solstice, Dec. 22, and the summer solstice, June 21, using a homemade gnomon. In: Greenleaf, Experiments in Space Science, pp. 88, 95-96
Measuring with a gnomon. Sci Teach, Apr. '77, pp. 44-45

GRAPHIC METHODS
Constructing graphs, including information on bar graphs, circle or pie graphs, interpolation, using a French curve; polar graphs; logarithmic graphs. In: Zebrowski, Fundamentals of Physical Measurement, pp. 73-95, 120-185

GRASS
Hot grass - bacteria working in grass clippings produce heat. In: Brown, 666 Science Tricks & Expts., pp. 109-111

GRASSES
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GRASSHOPPERS (INSECTS)
Crickets and grasshoppers - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 200-208
The red-legged grasshopper. In: Headstrom, Your Insect Pet, pp. 113-117, 146

GRAVIMETRIC ANALYSIS (CHEMISTRY)
See also, e.g., COULOMETRY (CHEMISTRY); POTENTIOMETRY (CHEMISTRY); VOLUMETRIC ANALYSIS (CHEMISTRY); and other specific chemical analytical methods

Determination of chloride in a soluble sample (gravimetric analysis). In: Skoog, Fundamentals, pp. 718-719
Determination of water in barium chloride dihydrate (gravimetric analysis). In: Skoog, Fundamentals, pp. 717-718
Electrogravimetric analysis: determination of copper in an aqueous solution, and separation and determination of copper and nickel in alloys. In: Skoog, Fundamentals, pp. 756-758
Gravimetric analysis of a soluble sulfate based upon precipitation with barium ion. In: Skoog, Fundamentals, p. 720-721
Gravimetric analysis of iron in a soluble sample. In: Skoog, Fundamentals, pp. 721-722
Gravimetric determination of aluminum by precipitation from homogeneous solution. In: Skoog, Fundamentals, pp. 722-724
Gravimetric determination of nickel in steel. In: Skoog, Fundamentals, p. 725

GRAVITATION
Experiment to measure the universal gravitational constant. Sci Am, Jan. '83, pp. 134-137

GRAVITY
See also WEIGHT (PHYSICS); WEIGHTLESSNESS

Gravity: do heavier things fall faster; which falls faster, a dropped object or a horizontally propelled one; how can the center of gravity cause stability. In: Nelson, Science, pp. 168-170
How can we create zero gravity by using centrifugal force? Demonstration involving swinging a pail containing water. In: Nelson, Science, p. 204
How do earth satellites stay up? A simple demonstration of the balancing of centrifugal force and gravity, using rubber bands and ping pong balls. In: Nelson, Science, p. 200
How to escape from earth: using marbles and cardboard bent in a curve to demonstrate gravitational pull and to simulate spacecraft launch. In: Simon, How to Be a Space Scientist, pp. 19-20
A lifting spinner. In: Richards, Science Magic, p. 10
Simple rubber band experiment demonstrating g-forces acting on an astronaut. In: Simon, How to Be a Space Scientist, pp. 30-31
Some simple demonstrations involving gravity and centrifugal force. In: Brown, 666 Science Tricks & Expts., pp. 197-201
What is the relationship between centrifugal force and gravity? In: Nelson, Science, p. 203
What would you weigh on the planets? In: Baldini, Student Science Activities, pp. 57-58
Your first launch: experiments with falling objects and with Newton's Second Law. In: Simon, How to Be a Space Scientist, pp. 4-5

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GRAVITY WAVES

Billows in the ionosphere are tracked with transistor radios. Sci Am, Sept. '80, pp. 232, 234, 236-238, 240, 243, 246

GREENHOUSES

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Making an indoor greenhouse in a pan or shallow box. In: Brown, 666 Science Tricks & Expts., p. 108

"Smart" greenhouse light controller. Pop Elec, May '81, pp. 67-69

Solar sprouter - a small greenhouse. In: Penrose, Dr. Zed's Dazzling, pp. 18-19

GROWTH (PLANTS)

See also, e.g., GERMINATION; HYDROTROPISM; the various headings beginning with PLANT and PLANTS; ROOTS (BOTANY); SEEDS

Allelopathy - chemical warfare in the plant kingdom. Sci Teach, Sept. '78, pp. 40-41

Bean maze experiment: testing effects of light and gravity on growth. In: Stein, Science Book, pp. 98-99

Can leaves be smothered? Experiment involving coating leaves with Vaseline or grease. In: Nelson, Science, p. 219

Do plants grow toward light? In: Nelson, Science, p. 232

Do plants need sunshine? Experiment involving masking part of a growing leaf. In: Nelson, Science, p. 220

Do roots seek water? In: Nelson, Science, p. 218

Geotropism - plant roots grow downward, responding to gravity. In: Brown, 666 Science Tricks & Expts., pp. 139-140

Growing corn from seed, including fertilizing the corn. In: Stein, Science Book, pp. 104-108

How do plants grow? Experiment involving observing and recording the growth of a plant. In: Nelson, Science, p. 226

How do seeds change into plants? Experiment involving staggered planting of seeds over several weeks. In: Nelson, Science, p. 222

How does temperature affect growth? In: Nelson, Science, p. 236

How much pressure a seedling exerts as measured by breaking through wax. In: Baldini, Student Science Activities, pp. 159-160

How roots respond to gravity. In: Baldini, Student Science Activities, pp. 160-161

In which direction do roots grow? In: Nelson, Science, p. 216

Is light necessary for the continued growth of plants? In: Nelson, Science, p. 231

Magnetobiology: investigations of magnetism and plant growth. Sci Teach, May '73, pp. 57-60

Plant force - simple experiment to demonstrate the great force exerted by plants as they grow. In: Brown, 666 Science Tricks & Expts., pp. 140-141, 143

Practical magnetotropism experiment. Sci Teach, Jan. '73, pp. 43-45

Ups and downs of plants - in which direction does a plant grow? In: Amery, KnowHow...Experiments, p. 26

Upsidedown roots - experiment in the direction of root growth. In: Penrose, Dr. Zed's Brilliant, pp. 52-53

Watch roots grow in a jar; what happens if the jar is inverted? In: Brown, 666 Science Tricks & Expts., p. 133

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GYPSUM
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Reaction of plaster of Paris with water to form gypsum - experiment suitable for the visually impaired. Sci Teach, Oct. '81, p. 51

GYROSCOPE
Gyroscope. In: Clarke, Encyclopedia of How It Works, pp. 116-117
Using a toy top or gyroscope to demonstrate dealing with some of the problems of space flight. In: Simon, How to Be a Space Scientist, pp. 22-23

HAIR
Experiment with a human hair and moisture in the air. In: Rosenfeld, Science, pp. 121, 124
Measuring the diameter of a hair by diffraction using laser light. In: Kallard, Exploring, pp. 202-203

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Some simple reactions with halides; demonstrating properties of halogens. Sci Teach, May '83, pp. 65-67

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Some simple reactions with halides; demonstrating properties of halogens. Sci Teach, May '83, pp. 65-67

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HARDNESS OF WATER
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HEADPHONES
Headphone amplifier. In: Carr, 104 Weekend, pp. 16-17
Headphone amplifier, with flat response from 20 to 25000 Hz. In: Mendelson, 103 Simple, p. 58
Headphone noise and volume limiter. In: Friedman, 99 Practical, pp. 44-45
Headphone Q-peaker. In: Friedman, 99 Practical, pp. 45-46

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Headset/loudspeaker converter allows you loudspeaker volume on a set designed for headset reception. In: Mendelson, 103 Simple, p. 108
Level control headphone adapter, will cut down amplitude of unexpectedly loud signals coming through headphones. In: Mendelson, 103 Simple, p. 117
Magnetic headset booster. In: Mendelson, 103 Simple, p. 79

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Hearing aid. In: Clarke, Encyclopedia of How It Works, pp. 117-119
Hearing-aid-to-radio converter. In: Mendelson, 103 Simple, p. 46
High-sensitivity hearing aid. In: Mendelson, 103 Simple, p. 40
How well do we hear? Testing hearing using the ticking of a clock and the whispering of words. In: Nelson, Science, p. 297

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The total artificial heart. Sci Am, Jan. '81, pp. 74-80, 170

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Does heat affect gases? Demonstration of expansion and contraction. In: Nelson, Science, p. 67
Electricity can produce heat and light. In: Graf, Safe and Simple, pp. 79-80
Energy leak detector reveals home heat and cooling losses. Pop Elec, Oct. '78, pp. 59-61
Heater, including information on heat transfer, central heating, boilers and heat exchangers, room heaters and hot water supplies. In: Clarke, Encyclopedia of How It Works, pp. 119-122
Liquid crystals, how to work with them, and a number of heat experiments using liquid crystals. In: Wels, Science, pp. 73-78
Thermal oscillators: systems that seesaw, buzz or howl under the influence of heat. Sci Am, Feb. '83, pp. 146-148, 151-154

HEAT - CONDUCTION
Bet you can't burn a hole in the bottom of a paper cup! - water in the cup conducts heat energy of the match away from the paper. In: Cobb, Bet You Can't, p. 91
Boil water in a paper cup without burning the cup, but the cup will burn if it contains only dry salt. In: Brown, 666 Science Tricks & Expts., p. 288
Do some substances conduct heat faster than others? In: Nelson, Science, p. 65
Fireproof handkerchief - demonstration with coin wrapped in a cloth. In: Brown, 666 Science Tricks & Expts., p. 276

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Fireproof paper - difficulty of burning paper wrapped tightly around a glass or tightly rolled. In: Brown, 666 Science Tricks & Expts., pp. 287-288

How does heat travel in solids? Demonstration with an iron rod to which balls of beeswax are stuck. In: Nelson, Science, p. 66

Thermal conductance of an insulating material; to determine the thermal conductance of various materials, particularly in relation to home heating. In: Norton, Solar Energy, pp. 82-87

Wet and dry pot holders - how well do they conduct heat? In: Brown, 666 Science Tricks & Expts., p. 316

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Air movements in your home. In: Simon, Projects, pp. 22-23

Circulation patterns in liquids, including investigation of patterns in Middle Eastern coffee. Sci Am, May '83, pp. 164, 167-170

Convection currents in air. In: Simon, Projects, pp. 20-21

Detector of vertical drafts. In: Stein, Science Book, p. 166

Generating convection currents, and demonstrating the movement using colored chalk. Sci Teach, Mar. '83, p. 66

How to see convection currents in water. In: Cherrier, Fascinating... Physics, pp. 85, 87

Improved demonstration of convection in liquids using iodine crystals. Sci Teach, Jan. '83, p. 65

HEAT - RADIATION AND ABSORPTION

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Are some colors warmer than others? In: Nelson, Science, p. 78

Bet you can't make a candle flame pass through a strainer! - metal strainer absorbs heat energy of the flame and temperature drops below the kindling point. In: Cobb, Bet You Can't, p. 90

Brown cupcakes; dark clothes; ice on dark and light pavement; etc. - effect of dark and light colors on heat absorption and radiation. In: Brown, 666 Science Tricks & Expts., pp. 324-325

Dark heat - demonstration that a black can will absorb sunlight more readily and will radiate heat away more quickly than a bright metal can. In: Brown, 666 Science Tricks & Expts., p. 283

Determining the heat absorbed by a closed automobile left in the sun. In: Norton, Solar Energy, pp. 9-13

Effect of roof overhang on the summer temperature of buildings; to determine the effect that roof overhang has on air temperature of an enclosed air space. In: Norton, Solar Energy, pp. 52-54

Experimenting with solar collection and radiation cooling. Sci Teach, Sept. '80, pp. 29-31

Measuring radiation patterns from a fireplace. Sci Am, Aug. '78, pp. 143-146

Reflection of heat and cold. In: Brown, 666 Science Tricks & Expts., p. 290

Tin can differential thermoscope. Sci Teach, Jan. '82, pp. 56-57

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Helicopter - how it works. In: Papallo, What Makes It Work, pp. 74-75
Paper helicopter. In: Shalit, Science, pp. 57-58

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Preparing a herbarium. In: Baldini, Student Science Activities, pp. 165-166

HERBS
Indoor gardening project: herbs to eat. In: Millard, Plants for Kids, pp. 62-64

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Mapping your family inheritance for ear lobes; other dominant recessive characteristics. In: Baldini, Student Science Activities, pp. 134-136
Nature vs. nurture - an experiment with fish. Sci Teach, Apr. '75, pp. 41-42

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Binary, octal and hexadecimal numbers - how to understand and apply the three basic numbering systems in computer programming. Pop Elec, Mar. '81, pp. 63-66
Number systems for microcomputers: how binary, octal, and hexadecimal systems work in relation to your computer. Computers & Electronics, Dec. '83, pp. 47-53, 55

HEXAGONS
Magic hexagon - drawing hexagonal figure without retracing or crossing a line. In: Shalit, Science, p. 32

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Easy ways to make holograms, using a helium-neon laser. Sci Am, Feb. '80, pp. 158, 161-162, 164, 167
Holograms with sound and radio waves; sound and radio waves recorded on film by a precooling process. In: Light and Its Uses, pp. 57-61 (also in "Amateur Scientist" column, Sci Am, Nov. '72)
Holography; properties of holograms; requirements and materials for hologram production; low-budget holography; some applications of holography; etc. In: Kallard, Exploring, pp. 221-259
Holography: science in three dimensions. Sci Teach, Jan. '82, pp. 46-48
Homemade hologram; experimenting with homemade and ready-made holograms. In: Light and Its Uses, pp. 48-54 (also in "Amateur Scientist" column, Sci Am, Feb. '67)
Stability of the apparatus; insuring a good hologram by controlling vibration and exposure. In: Light and Its Uses, pp. 55-56 (also in "Amateur Scientist" column, Sci Am, July '71)

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You and a horse - calculating horsepower of person climbing stairs. In: Brown, 666 Science Tricks & Expts., p. 374

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Model hovercraft. In: Richards, Science Magic, p. 23

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Can we measure humidity in the air? Constructing a simple hygrometer. In: Nelson, Science, p. 184
Measure air moisture - crude instrument illustrates principle of hygrometer. In: Brown, 666 Science Tricks & Expts., pp. 42-43
Measurement of temperature and humidity with a sling psychrometer. In: Schaefer, A Field Guide, pp. 307-308
Simple method for determining humidity - wet- and dry-bulb thermometer method. In: Nelson, Science, p. 185
Solid-state humidity control device. Pop Elec, Nov. '79, pp. 81-83
Sympathetic ink/humidity indicator (cobalt chloride solution). In: Chen, Entertaining, p. 20
Weather indicator - cardboard painted with cobalt chloride solution is a different color when wet and dry. In: Cherrier, Fascinating... Chemistry, p. 51

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Hummingbird feeder. In: Penrose, Dr. Zed's Dazzling, pp. 16-17

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Determination of water in barium chloride dihydrate (gravimetric analysis). In: Skoog, Fundamentals, pp. 717-718
Experiments with various salts - copper sulfate, washing soda, sodium chloride, plaster of Paris - to determine their behavior in relation to water: is water lost on heating or on exposure to air, is water absorbed by exposed salts? In: Rosenfeld, Science, pp. 117-120, 122-123, 125, 170
Plaster of Paris sets when its water of crystallization returns. In: Morgan, First Chemistry Book, pp. 49-52
Water is a part of some crystal structures - experiment using washing soda to demonstrate water of hydration. Also discussion of plaster of Paris. In: Morgan, First Chemistry Book, pp. 46-50
Water of hydration - a simplification. Sci Teach, Sept. '81, p. 53
Water of hydration - a volumetric approach; analyzing hydrates of carbonates. Sci Teach, Apr. '83, p. 56

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Making a simple water turbine. In: Amery, KnowHow...Experiments, p. 30
A mussel turbine. In: Lanners, Secrets, pp. 106-107

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Demonstration showing that magnesium reacts with steam to produce hydrogen. Sci Teach, May '83, pp. 60, 65, and cautionary note p. 67
Electrolysis of water produces oxygen and hydrogen gas. In: Morgan, Adventures in Electrochemistry, pp. 188-195
Electrolytic cell for producing larger quantities of oxygen and hydrogen. In: Morgan, Adventures in Electrochemistry, pp. 204-208
Experiments with hydrogen: the lightness of hydrogen, pouring hydrogen upward. In: Morgan, Adventures in Electrochemistry, pp. 208-210
Fire on water - pea-sized piece of potassium or sodium on water will produce hydrogen which ignites from the heat of reaction. In: Chen, Entertaining, p. 50
How to make and test for hydrogen gas. In: Baldini, Student Science Activities, pp. 97-98
How to prove that the bubbles in the electrolysis of water are oxygen and hydrogen. In: Morgan, First Chemistry Book, pp. 57-64
Relative rates of diffusion of air and hydrogen. In: Chen, Entertaining, pp. 76-78
Voltameter apparatus produces chlorine and hydrogen from sodium chloride solution and can be constructed to make explosive soap bubbles. In: Cherrier, Fascinating...Chemistry, pp. 86-87
You can separate water into oxygen and hydrogen in your home laboratory. In: Morgan, First Chemistry Book, pp. 53-57

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Easy oxygen from hydrogen peroxide and baking soda. In: Brown, 666 Science Tricks & Expts., pp. 361-362
Oxygen from hydrogen peroxide. In: Brown, 666 Science Tricks & Expts., p. 336
Oxygen is a fire-maker - making oxygen with hydrogen peroxide and manganese dioxide. In: Morgan, First Chemistry Book, pp. 73-75
Preparation of oxygen from hydrogen peroxide, and the effect of manganese dioxide as a catalyst. Sci Teach, Sept. '73, p. 52
Two redox reaction experiments: percentage of hydrogen peroxide in drugstore hydrogen peroxide solution, and analysis of vitamin C (ascorbic acid) in citrus juice. Sci Teach, Apr. '74, p. 47

HYDROGEN PHOSPHIDE
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HYDROGEN SULPHIDE
A big bad odor - hydrogen sulfide from heating of photographer's hypo. In: Brown, 666 Science Tricks & Expts., pp. 343-344

HYDROPONICS
Grow a sweet potato vine in water (without soil). In: Taylor, Kids' Whole Future Catalog, p. 65
How do we make a decorative house plant with a sweet potato? Growing a sweet potato in water. In: Nelson, Science, p. 239
Hydroponics - studies in plant culture with historical roots. Sci Teach, Sept. '81, pp. 47-49

HYDROPONICS (continued)
Johnsen, Gardening without Soil -- how to set up different kinds of no-soil gardens, how to make plant food and soilless growing mixtures, etc.

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Do roots seek water? In: Nelson, Science, p. 218
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Hydrotropism - seeking of water by plant roots. In: Brown, 666 Science Tricks & Expts., p. 139

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Hydras as pets in a jar. In: Simon, Pets, pp. 19-24, 90-91

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Can we measure humidity in the air? Constructing a simple hygrometer. In: Nelson, Science, p. 184
An IC (integrated circuit) hygrometer. In: Fox, Unique Electronic, pp. 88-93
Measure air moisture - crude instrument illustrates principle of hygrometer. In: Brown, 666 Science Tricks & Expts., pp. 42-43
Measurement of temperature and humidity with a sling psychrometer. In: Schaefer, A Field Guide, pp. 307-308
Simple method for determining humidity-- wet- and dry-bulb thermometer method. In: Nelson, Science, p. 185

ICE
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Arctic antics - experiments with ice. In: Richards, Science Magic, p. 46
Bet you can't cut an ice block in two with a wire! - pressure of the wire melts the ice; ice then refreezes. In: Cobb, Bet You Can't, pp. 92-93
Bet you can't raise the temperature of ice water by heating it! - temperature of ice water remains the same until the ice is melted. In: Cobb, Bet You Can't, p. 96
Build an infra-red road icing alert. Pop Elec, Oct. '80, pp. 61-64
Determining the latent heat of a substance - experiment using ice; to measure the effect of incoming solar radiation on the rate of melting ice. In: Norton, Solar Energy, pp. 16-19
Freezing - experiment with olive oil to show that the oil freezes from the bottom, whereas water ice floats. In: Brown, 666 Science Tricks & Expts., pp. 278-279
Freezing your finger to an ice cube. In: Brown, 666 Science Tricks & Expts., p. 285
How cold does ice get? Demonstration showing the effect of salt on the freezing point of water. In: Nelson, Science, p. 53
Ice and salt - salt lowers the freezing point of ice. In: Brown, 666 Science Tricks & Expts., pp. 353-354
Ice cube lifting trick, using salt to lower the freezing point of ice. In: Herbert, Mr. Wizard's, p. 24
"Icy road warning indicator" circuit. Pop Elec, Aug. '77, pp. 71-72

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Icy temperature - demonstrations that when ice is melting or water boiling, temperature of the ice or the water remains constant until the ice has melted or the water has boiled. In: Brown, 666 Science Tricks & Expts., p. 282
Lenses made from ice. Sci Am, Apr. '83, pp. 132-134
Making a column of ice - a demonstration that shows that water expands on freezing. In: Goldstein-Jackson, Experiments, pp. 36-37
Mystery ice - demonstration with a bottle of soft drink; also demonstration of the expansion of water on freezing. In: Brown, 666 Science Tricks & Expts., pp. 274-275
Pressure and equilibrium: passing a fine wire through an ice cube. Sci Teach, Nov. '82, p. 54
Showing why icebergs float. In: Goldstein-Jackson, Experiments, pp.46-47
Sinking colored ice cubes and diffusion. Sci Teach, Oct. '82, p. 50, and comment Jan. '83, p. 10
Strong ice - demonstration of the strength of water/ice expansion on freezing. In: Amery, KnowHow...Experiments, p. 25
Various demonstrations with ice - melting under pressure, change in volume on melting, convection experiments with ice cubes, dissolved gases in ice. In: Brown, 666 Science Tricks & Expts., pp. 156, 170-171, 185
When water freezes does it expand or contract? In: Nelson, Science, p.55

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Ice cream making: an example of applied chemistry. Sci Teach, Jan.'75, pp. 50-51

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Active audio impedance translator and buffer. In: Carr, 104 Weekend, pp. 136-138
High-to-low impedance mike matcher, matching high-impedance microphones into low-impedance inputs. In: Mendelson, 103 Simple, p. 55
Low-to-high impedance mike matcher, matching low-impedance microphone into high-impedance input. In: Mendelson, 103 Simple, p. 54
Perform complete impedance measurements with this r-f bridge. Pop Elec, May '79, pp. 63-67

INDICATORS AND TEST PAPERS
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Chemical color reaction: reversing colors (red to blue and blue to red) - experiments with Congo red and a saturated litmus solution. In: Chen, Entertaining, pp. 14-15
Chemical color reaction: two blues make one red, two reds make one blue - litmus paper (or litmus solution) reactions. In: Chen, Entertaining, pp. 15-16
Chemical color reactions involving oxidation-reduction indicators - reactions using methylene blue, resazurin solution, indophenol, benzoin, indigo carmine and phenanthrenequinone in various demonstrations. In: Chen, Entertaining, pp. 37-43

INDICATORS AND TEST PAPERS (continued)

Chemical indicators - using boiled red cabbage solution as an acid/base indicator, and making phenolphthalein indicator for bases. In: Baldini, Student Science Activities, pp. 107-108

Chemical polarity indicator shows which wire is positive and which negative when connected to a direct current source. In: Morgan, Adventures in Electrochemistry, p. 268

Chemical trick using soap and phenolphthalein indicator - soapy water turns bright red. In: Shalit, Science, p. 40

Coloring liquids red, violet or green with the same dye - using red cabbage to make an acid/base indicator. In: Goldstein-Jackson, Experiments, pp. 122-123

Colour magic - beetroot or red cabbage acid/base indicator. In: Tuey, How to Be, pp. 14-15

Cooked red cabbage juice as an acid/base indicator, and beet juice used as a base indicator; also using blackberry jam/jelly solution as an indicator. In: Brown, 666 Science Tricks & Expts., p. 335

Game involving identifying colorless fluids using chemical indicators. In: Cherrier, Fascinating...Chemistry, pp. 76-79

How can we determine which is the positive pole of a battery? Potato used in this demonstration. In: Nelson, Science, p. 128

How to detect a base (using litmus paper). In: Morgan, First Chemistry Book, pp. 113-115

Liquid chameleon - chemistry demonstration involving color changes and using red cabbage indicator, vinegar and ammonia. In: Cherrier, Fascinating...Chemistry, p. 80

Magic flower - a painting using chemical indicators. In: Shalit, Science, pp. 34-36

Potato polarity indicator for a battery. In: Graf, Safe and Simple, p. 83

Potato test for electrical polarity. In: Brown, 666 Science Tricks & Expts., pp. 202-203

Red cabbage chemical indicator to test for acids and bases. In: Herbert, Mr. Wizard's, p. 87

Red liquid (phenolphthalein solution) which your breath will turn clear. In: Morgan, First Chemistry Book, pp. 138-139

Red, white, and blue - a trick involving three simple chemical reactions, using ammonia, copper sulfate, phenolphthalein, and magnesium sulfate. In: Shalit, Science, pp. 44-45

Simple beet juice indicator for acids and bases. In: Brown, 666 Science Tricks & Expts., p. 338

Spectacular acid and base test - indicator from red cabbage. In: Penrose, Dr. Zed's Brilliant, pp. 14-15

What matter is acidic or alkaline? Testing with litmus paper. In: Nelson, Science, p. 16

You can prepare an indicator from cabbage; the red cabbage juice is changed to green by a base. In: Morgan, First Chemistry Book, pp. 120-121

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Build the reactance measuring set - measures inductance and capacitance. Pop Elec, Mar. '81, pp. 67-71, 76-78

Inductance checker. Pop Elec, Aug. '73, pp. 98-99

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Eddy current effect. Sci Teach, Jan. '76, p. 42, and addition Apr. '77, p. 46
How induction works (simple demonstration using a compass and nails wound with insulated wire). In: Chapman, Young Scientist, pp.18-19
Inductor checker and its use. In: Giant Handbook, pp. 422-424
Swing discs to show Lenz's law. Sci Teach, Apr. '76, pp. 35-36, and comment Oct. '76, p. 56

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Breaking either one of two strings. In: Goldstein-Jackson, Experiments, pp. 88-89
Demonstrations of inertia (Newton's First Law of Motion) - caged marble, air car, coin and card, newspaper on stick, spinning eggs. In: Gardner, Moving Right Along, pp. 59-64
Demonstrations of Newton's First Law of Motion - inertia and motion. In: Rosenfeld, Science, pp. 55-63, 167
Five simple tricks with inertia. In: Shalit, Science, pp. 50-52
Inertia and momentum - ten groups of experiments outlined. In: Brown, 666 Science Tricks & Expts., pp. 7-14
Inertia tricks. In: Penrose, Dr. Zed's Brilliant, pp. 36-37
Knocking four eggs into four glasses. In: Goldstein-Jackson, Experiments, pp. 106-107
Tricks with inertia. In: Richards, Science Magic, pp. 12-13

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INFECTION
Infection of a good apple with bacteria from a rotting one. In: Brown, 666 Science Tricks & Expts., p. 145

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Infrared radiation filter construction. Sci Am, Mar. '73, pp. 118-119, 128
Single-channel infrared remote-control system. Pop Elec, June '82, pp. 84, 86-88

INK
How can we make invisible ink? Lemon juice used - when heated it turns brown. In: Nelson, Science, p. 17
Ink eradicator (lemon juice and bleach). In: Brown, 666 Science Tricks & Expts., p. 363
Ink manufacture. In: Clarke, Encyclopedia of How It's Made, pp.85-87

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Invisible fruit inks and invisible inks from other liquids. In: Herbert, Mr. Wizard's, p. 88
Invisible writing and drawing with a variety of liquids, including ten recipes for invisible ink. In: Cherrier, Fascinating...Chemistry, pp. 47-50
Magic ink chemical trick using tannin, ferric chloride and oxalic acid. In: Shalit, Science, p. 47
Make ink, using steel wool, vinegar, and tea. In: Brown, 666 Science Tricks & Expts., pp. 347-348
Secret inks. In: Chen, Entertaining, p. 19
Sympathetic ink/humidity indicator (cobalt chloride solution). In: Chen, Entertaining, p. 20
Tannin is a useful acid; making ink with tea and a suitable iron compound. In: Morgan, First Chemistry Book, pp. 111-112

INSECTICIDES
Two homemade insecticides. Sci Teach, Nov. '83, p. 54

INSECTS
See also names of specific insects, e.g., AMBUSH BUGS; ANT LIONS; ANTS; APHIDS; BACKSWIMMERS; BEES; BEETLES; BUTTERFLIES; CATERPILLARS; CICADA; COCKROACHES; CRICKETS; DAMSEL FLIES; DRAGONFLIES; FIREFLIES; FLIES; FRUIT FLIES; GIANT WATER BUGS; GRASSHOPPERS; LEAF-HOPPERS; MANTIDS; MEAL WORMS; MILKWEED BUG, LARGE; MOSQUITOES; MOTHS; SAWFLIES; SNOWFLEA; SPITTLEBUG; TERMITES; TREEHOPPER; WALKING STICK; WASPS; WATER BEETLES; WATER BOATMAN; WATER MEASURER; WATER SCORPIONS; WATER STRIDERS; WORMS; and also see INSECTICIDES; GALLS (BOTANY)

About insects - abundance and distribution, characteristics of insects. In: Headstrom, Your Insect Pet, pp. 11-28
Cold weather entomology: suggestions for gathering and studying insects in winter. Sci Teach, Jan. '83, pp. 49-51
How to keep notes on insect pets. In: Roberts, You Can, p. 60
How to make worm cookies step-by-step; using worms as food, and how worms and other insects measure up as sources of protein. In: Taylor, Kids' Whole Future Catalog, p. 75
The oak gall - observation, collection, chemistry. In: Baldini, Student Science Activities, pp. 190-194
Procedure for observation of an insect and some general hints on drawing an insect. In: Baldini, Student Science Activities, pp.188-190
Stokes, A Guide to Observing Insect Lives -- includes sections on finding and observing insects, basic facts about insects and sections on insect observation for each season of the year. Information on approximately 60 insects
Taylor, Entertaining with Insects -- information on how to make food dishes using insects, where to buy insects and how to collect and raise them on one's own

INSECTS - CLASSIFICATION
Developing an insect order wheel. In: Baldini, Student Science Activities, pp. 194-196
The eight major orders of insects. In: Stokes, Guide, pp. 11-15
How do we study and classify common insects? In: Nelson, Science, pp. 271-272

INSECTS - COLLECTION AND PRESERVATION

INSECTS - COLLECTION AND PRESERVATION
Building a small, simple cage from a jar. In: Nelson, Science, p. 263
Cold weather entomology: suggestions for gathering and studying insects in winter. Sci Teach, Jan. '83, pp. 49-51
Collecting and keeping pets, including insects, in a jar. In: Simon, Pets, pp. 13-17, 90-91
Finding and keeping your insect pets. In: Headstrom, Your Insect Pet, pp. 29-36
How can we preserve insects or make a butterfly collection? In: Nelson, Science, pp. 275-276
Insect catcher. In: Penrose, Dr. Zed's Dazzling, pp. 32-33
Insect killing jar. In: Brown, 666 Science Tricks & Expts., pp.147-148
Insect life cycle display box. In: Baldini, Student Science Activities, pp. 181-182
Making a shoe box spreading board to spread out wings of insects to dry. In: Baldini, Student Science Activities, pp. 177-179
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Making an insect-rearing cage. In: Baldini, Student Science Activities, pp. 183-184
Making insect storage boxes. In: Baldini, Student Science Activities, p. 179
Making triangular paper envelopes for temporary storage of large dead insects. In: Baldini, Student Science Activities, pp. 170-171
Pinning and mounting insects; making an insect pin gauge. In: Baldini, Student Science Activities, pp. 171-174
Preparing permanent microscope slides of insect parts. In: Baldini, Student Science Activities, pp. 184-185
Preserving the insect collection - moth ball mount; insect repellent holder. In: Baldini, Student Science Activities, pp. 175-177
Water bugs of various kinds, as pets in a jar. In: Simon, Pets, pp. 34-38, 90-91

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INSULATION (HEAT)
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Simulation of a heat shield on a space vehicle using test tubes or nursing bottles coated with candle wax. In: Simon, How to Be a Space Scientist, pp. 28-29
Thermal conductance of an insulating material; to determine the thermal conductance of various materials, particularly in relation to home heating. In: Norton, Solar Energy, pp. 82-87

INSULATION (HEAT) (continued)
Thermal insulation; exercises to be performed using data given regarding insulating material. In: Norton, Solar Energy, pp. 106-107

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Universal integrator. In: Carr, 104 Weekend, pp. 34-42

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INTERCOMMUNICATION SYSTEMS
Bidirectional intercom system circuit. Pop Elec, Aug. '77, p. 72
Build a semiconductor laser communications system. Pop Elec, July '75, pp. 39-44
Communicate over light beams with the first single-LED transceiver. Pop Elec, Mar. '74, pp. 66-70
Experimenting with light-beam communications. Pop Elec, Apr. '75, pp. 40-42, and correction Aug. '75, p. 6
Hobbyist's modem. Pop Elec, Mar. '76, pp. 43-46, 49-50, and correction May '76, p. 6
Intercom circuit. Pop Elec, Dec. '77, pp. 85, 88
Interoffice phone amplifier. In: Mendelson, 103 Simple, p. 92
Light-wave voice communicator. Pop Elec, May '80, p. 103
Making a 2-watt amplifier module, and further development into an intercom system. In: Giant Handbook, pp. 351-357
Personal microwave communications system - link for audio, video or data communications. Pop Elec, Oct. '78, pp. 42-50; Nov. '78, pp. 71-72, 79-80; and Jan. '79, pp. 70, 74-76; and addition July '79 p. 6
Pulse-frequency modulated infrared communicator. Pop Elec, Feb. '82, pp. 98-101
Remote security communicator - how to send control and voice/music signals hundreds of feet away through a common ac power line. Computers & Electronics, Apr. '83, pp. 66-68, 70, 72, 74-75
Two-station intercom system circuit for use in home or office. Pop Elec, Aug. '75, pp. 81-82
Two telephone intercom systems. In: Giant Handbook, pp. 286-289

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Bright colors in soap film are a lesson in wave interference. Sci Am, Sept. '78, pp. 232-236, 240, 242
Collimation tester. In: Kallard, Exploring, pp. 128-129
Cyclic interferometer; an interferometer constructed from plate glass and lenses. In: Light and Its Uses, pp. 70-71 (also in "Amateur Scientist" column, Sci Am, Feb. '73
Demonstrating the Mach-Zehnder and Jamin interferometers - demonstrations using laser light. In: Kallard, Exploring, pp. 146-148

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Fabry-Perot interferometer, using laser light. In: Kallard, Exploring, pp. 155-156

Interference and interferometers. In: Kallard, Exploring, pp. 111-112

Interference demonstration with a small glass tube, using laser light. In: Kallard, Exploring, pp. 121-122

Interference demonstration with plane parallel glass plates, using laser light. In: Kallard, Exploring, pp. 117-120

Interference in scattered light. In: Kallard, Exploring, p. 183

Interference patterns made by motes on a dusty mirror. Sci Am, Aug. '81, pp. 146-148, 151-152, 154

Interference with Fresnel's biprism, using laser light. In: Kallard, Exploring, pp. 113-115

Interference with polarized light (Fresnel-Arago laws), using laser light. In: Kallard, Exploring, pp. 139-140

Interferometer for measuring parallelism and small wedge angles, using laser light. In: Kallard, Exploring, pp. 120-121

Interferometer to measure the dirt content of water. In: Light and Its Uses, pp. 82-85 (also in "Amateur Scientist" column, Sci Am, June '73)

Interferometer to measure velocity; a laser interferometer that converts a velocity to a sound signal. In: Light and Its Uses, p. 81 (also in "Amateur Scientist" column, Sci Am, Dec. '65)

Interferometric flatness testing, using laser light. In: Kallard, Exploring, pp. 122-125

Interferometric temperature monitoring. In: Kallard, Exploring, pp. 134-135

Laser speckle phenomena. In: Kallard, Exploring, pp. 160-162

Michelson interferometer; a homemade instrument that can measure a light wave. In: Light and Its Uses, pp. 66-69 (also in "Amateur Scientist" column, Sci Am, Nov. '56)

Michelson interferometer, using laser light. In: Kallard, Exploring, pp. 135-138

Michelson interferometer, using laser light, used for vibration analysis. In: Kallard, Exploring, pp. 144-145

Michelson-type interferometer, using laser light, to measure the index of refraction of a gas. In: Kallard, Exploring, pp. 140-143

Newton's rings demonstration, using laser light. In: Kallard, Exploring, pp. 126-127

Point-diffraction ("Smartt") interferometer, using laser light. In: Kallard, Exploring, pp. 152-154

Sagnac's triangular interferometer, using laser light. In: Kallard, Exploring, pp. 149-151

Self-imaging without lenses (Fourier imaging), using laser light. In: Kallard, Exploring, pp. 213-217

Series interferometer. In: Light and Its Uses, pp. 76-80 (also in "Amateur Scientist" column, Sci Am, June '64)

Simple optical experiments in which spatial filtering removes the "noise" from pictures; process using laser light is based on diffraction and interference of light waves. Sci Am, Nov. '82, pp. 194, 198, 198B, 199, 202-204, 204B-206

Speckle interferometer; a laser interferometer that can measure displacement. In: Light and Its Uses, pp. 72-75 (also in "Amateur Scientist" column, Sci Am, Feb. '72)

INTERFERENCE (LIGHT) AND INTERFEROMETERS (continued)

"Speckle" on a surface lit by laser light can be seen with other kinds of illumination. Sci Am, Feb. '82, pp. 162, 164-170

Speckle-shearing interferometry, using laser light. In: Kallard, Exploring, pp. 169-171

Thickness measurement by interference, using laser light. In: Kallard, Exploring, pp. 129-132

Thin film interference using an air wedge and laser light. In: Kallard, Exploring, pp. 132-133

Various demonstrations of light interference. In: Brown, 666 Science Tricks & Expts., pp. 305-307, 312-313

Young's double slit method for producing interference, using laser light. In: Kallard, Exploring, pp. 112-113

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Determination of iodine and iodide in a mixture by iodate titration. In: Skoog, Fundamentals, pp. 353-354 and 751 and other pages referred to in experimental instructions

Potentiometric titration of a chloride-iodide mixture. In: Skoog, Fundamentals, pp. 411 and 753+, and other pages as referred to in experimental procedure

IODINE

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Chemical color reaction: clock reaction involving iodine and iron tartrate. In: Chen, Entertaining, pp. 31-33

Chemical color reaction: iodine clock reaction - deep blue starch-iodine complex formed. In: Chen, Entertaining, pp. 25-27

Chemical color reaction: reversible color change accompanying a temperature change, using iodine-starch solution. In: Chen, Entertaining, p. 37

Chemistry in the toaster - toast is tested for starch with iodine; untoasted part gives starch test, toasted part doesn't. In: Brown, 666 Science Tricks & Expts., p. 364

Chemist's test for starch. In: Morgan, First Chemistry Book, pp. 90-93

Coulometric analysis: titration of trivalent arsenic with iodine. In: Skoog, Fundamentals, pp. 758-759 and other pages referred to in description

Deep purple magic - demonstration showing differing colors of iodine in oil and in water. In: Shalit, Science, p. 37

Determination of antimony in stibnite using iodine solution titration. In: Skoog, Fundamentals, pp. 362, 747-748

Determination of iodine and iodide in a mixture by iodate titration. In: Skoog, Fundamentals, pp. 353-354 and 751 and other pages referred to in experimental instructions

How to detect the starch in rice; how to use the iodine test for starch in other foods. In: Morgan, First Chemistry Book, pp. 93-95

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How to remove iodine stains - experiment using "hypo" (sodium thiosulfate). In: Morgan, First Chemistry Book, pp. 95-97
Improved demonstration of convection in liquids using iodine crystals. Sci Teach, Jan. '83, p. 65
Iodimetric and iodometric methods of analysis, including specific experimental determinations. In: Skoog, Fundamentals, pp. 747-753 and chapter 16
Magic tea glass - trick using sodium thiosulfate and iodine. In: Shalit, Science, p. 38
Preparation and standardization of iodine solutions for titration analyses. In: Skoog, Fundamentals, p. 747
Solubility - demonstration that iodine in water will pass into mineral oil when oil is shaken with the water solution. In: Brown, 666 Science Tricks & Expts., pp. 350-351
Some reactions of iodine. Sci Teach, Oct. '82, p. 59
Starch iodine color mystery. In: Brown, 666 Science Tricks & Expts., pp. 352-353
Starch-iodine trick: water with a few drops of iodine turns blue when stirred with a finger that has been dipped in a cornstarch solution. In: Brown, 666 Science Tricks & Expts., p. 92
Starchy crackers - iodine test for starch, and effect of saliva on starch. In: Brown, 666 Science Tricks & Expts., p. 138
Testing food for starch using iodine. In: Baldini, Student Science Activities, p. 115
Testing for leaf starch using the iodine test. In: Stein, Science Book, p. 220
Testing for vitamin C using the vitamin's ability to destroy the blue color of iodine-starch complex. In: Brown, 666 Science Tricks & Expts., pp. 329-330
What foods contain carbohydrates (starches and sugars)? Tests with iodine solution and Benedict's solution. In: Nelson, Science, p.304

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Billows in the ionosphere are tracked with transistor radios. Sci Am, Sept. '80, pp. 232, 234, 236-238, 240, 243, 246

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Determination of iron in an ore using a dichromate titration. In: Skoog, Fundamentals, p. 746 and earlier material referred to
Determination of iron in an ore using cerium(IV) titration. In: Skoog, Fundamentals, pp. 745-746 and other pages of text referred to in instructions
Determination of iron in an ore using Zimmermann-Reinhardt reagent titration. In: Skoog, Fundamentals, pp. 741-743
Determination of iron in water by spectrophotometry. In: Skoog, Fundamentals, pp. 761-763 and other pages as indicated in the text

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Electrochemical process of rusting - experiment to demonstrate that rusting is an electrochemical action. In: Morgan, Adventures in Electrochemistry, pp. 259-263
Gravimetric analysis of iron in a soluble sample. In: Skoog, Fundamentals, pp. 721-722
Heat a piece of iron or steel wire over a gas burner in a darkened room to show successive color changes as temperature increases - analogy to various colors of star light. In: Simon, How to Be a Space Scientist, p. 65
Hot iron coated with powdered sulfur is inserted into a jar of oxygen - reddish-brown iron (ferric) oxide is produced. In: Morgan, Adventures in Electrochemistry, pp. 216-217
How to make a compound, demonstrating principles that mixing does not lead necessarily to chemical combination and that heating can lead to compound formation - reaction of iron and sulfur. In: Baldini, Student Science Activities, pp. 104-105
Oxidize iron in a jar, then test the jar with a lighted candle. In: Brown, 666 Science Tricks & Expts., p. 347
What is iron rust? Demonstration of the rusting of iron. In: Nelson, Science, p. 14

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Chemical color reaction: clock reaction involving iodine and iron tartrate. In: Chen, Entertaining, pp. 31-33
Magic ink chemical trick using tannin, ferric chloride and oxalic acid. In: Shalit, Science, p. 47
Making ferric (iron) oxide by electrolysis. In: Morgan, Adventures in Electrochemistry, pp. 217-218
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Potentiometric titration of iron(II) with quadrivalent cerium. In: Skoog, Fundamentals, pp. 753, 756, chapter 17, and other pages as referred to in experimental procedure

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JACOB'S LADDER
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Zoom balloons using string, straws and balloons. In: Penrose, Dr. Zed's Dazzling, pp. 44-45

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Some notes on Kirlian photography, including how to make Kirlian photographs using a purchased electrophotography kit with piezoelectric power supply. In: Wels, Science, pp. 38-44

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Direct shadow demonstration (shadowgraphy) - simple method, using laser light, by which small changes in the refractive index of air can be made visible. In: Kallard, Exploring, pp. 61-62

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Measuring the wavelength of light with a ruler. In: Kallard, Exploring, p. 201
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Optical lever - measuring angular rotation of a mirror using laser beam reflection. In: Kallard, Exploring, pp. 43-44
Optical simulation of the electron microscope, using laser light. In: Kallard, Exploring, pp. 217-218

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Point-of-sale label reading using laser light. In: Kallard, Exploring, pp. 180-182

Projecting crystal patterns in convergent laser light. In: Kallard, Exploring, pp. 99-100

Recording and measuring refractive index gradients using laser light. In: Kallard, Exploring, pp. 59-60

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Remotely sensing tachometer, using laser light. In: Kallard, Exploring, p. 44

Rock music sound displayed as patterns of light using a laser. Sci Teach, Oct. '76, pp. 43-44

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Scanning a focused laser light beam over a wide flat field. In: Kallard, Exploring, pp. 53-54

Self-imaging without lenses (Fourier imaging), using laser light. In: Kallard, Exploring, pp. 213-217

Simple optical experiments in which spatial filtering removes the "noise" from pictures; process using laser light is based on diffraction and interference of light waves. Sci Am, Nov. '82, pp. 194, 198, 198B, 199, 202-204, 204B-206

Simple polarization demonstrations using laser light. In: Kallard, Exploring, pp. 88-99

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Thickness measurement by interference, using laser light. In: Kallard, Exploring, pp. 129-132

Thin film interference using an air wedge and laser light. In: Kallard, Exploring, pp. 132-133

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Unusual kind of gas laser puts out pulses in the ultraviolet. Sci Am, June '74, pp. 122-127, 136

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Vibration detection and examining vibrating objects using laser speckle. In: Kallard, Exploring, pp. 167-169

Visual display of sound dynamics using laser light. In: Kallard, Exploring, pp. 50-53

Voice and TV picture transmission over a laser beam. In: Kallard, Exploring, pp. 73-75

Young's double slit method for producing interference, using laser light. In: Kallard, Exploring, pp. 112-113

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Cross-staff, primitive equivalent of the sextant - construction and use for latitude and astronomical measurements. Sci Am, Nov. '74, pp. 126-127, 134, 146

How can our latitude be determined? Procedure uses compass, protractor and a weight. In: Nelson, Science, p. 154

How to find your latitude anywhere at any time during the year using a homemade gnomon. In: Greenleaf, Experiments in Space Science, pp. 88, 97

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How to measure your latitude with a transit instrument. In: Greenleaf, Experiments in Space Science, pp. 20-21

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Amperometric titrations: titration of lead and titration of sulfate ion, using a dropping mercury electrode. In: Skoog, Fundamentals, pp. 760-761 and chapter 21

Diffusion of mercury through lead by filtration. In: Chen, Entertaining, p. 87

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Lead chemistry - lead plates out on zinc suspended in lead acetate solution. In: Brown, 666 Science Tricks & Expts., pp. 366-367

Lead "tree" - an electrochemical experiment using zinc and a lead acetate solution. In: Morgan, Adventures in Electrochemistry, pp. 144-145

Lead tree in gel - reaction in which lead from solution plates out on mossy zinc. In: Chen, Entertaining, p. 81

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K_{sp} determination using lead chloride. Sci Teach, Oct. '82, p. 58

LEAF-HOPPERS (INSECTS)
Leafhoppers - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 138-142

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LEAVES
Can leaves be smothered? Experiment involving coating leaves with Vaseline or grease. In: Nelson, Science, p. 219
Chlorophyll is needed by green leaves for making starch - how to show the presence of starch in leaves. In: Baldini, Student Science Activities, pp. 144-146
Do plants need sunshine? Experiment involving masking part of a growing leaf. In: Nelson, Science, p. 220
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How to observe that plants give off water through their leaves. In: Baldini, Student Science Activities, pp. 143-144
Is it possible to find two leaves alike? In: Brown, 666 Science Tricks & Expts., pp. 100-101
Leaf print using a crayon and a hot iron. In: Brown, 666 Science Tricks & Expts., p. 78
Making a leaf rubbing on a piece of cloth. In: Nelson, Science, p. 248
Making a "splatter print" of a leaf. In: Nelson, Science, p. 243
Making a blue print of a leaf. In: Nelson, Science, p. 244
Observation of abscission cells in fallen leaves, and brief explanation of what causes leaves to fall. In: Brown, 666 Science Tricks & Expts., p. 125
Testing for leaf starch using the iodine test. In: Stein, Science Book, p. 220
Water from leaves. In: Brown, 666 Science Tricks & Expts., p. 101

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Getting electricity from a lemon. In: Graf, Safe and Simple, pp. 78-79
How can we make invisible ink? Lemon juice used - when heated it turns brown. In: Nelson, Science, p. 17
Pollution to order: sulfur dioxide from photographer's hypo and lemon juice. In: Brown, 666 Science Tricks & Expts., p. 343
Sulfur dioxide from photographer's hypo and lemon juice. In: Brown, 666 Science Tricks & Expts., p. 363

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Can a magnifying glass start a fire? In: Nelson, Science, p. 86
Determination of the focal length of a convex lens by autocollimation using laser light. In: Kallard, Exploring, p. 62

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Does water have magnifying and refractive qualities? Demonstration involves observation of the appearance of a spoon in a tumbler of water. In: Nelson, Science, p. 85

Effect of a converging lens on energy collection; to measure the energy-concentrating effectiveness of a converging lens using direct rays of the sun. In: Norton, Solar Energy, pp. 31-33

Effect of a converging lens on temperature; to measure the temperature achieved by concentrating the sun's direct rays with a converging lens. In: Norton, Solar Energy, pp. 29-30

Glass globe into a microscope. In: Lanners, Secrets, pp. 128-129

Gradient-index (GRIN) lens in which the index of refraction varies internally. Sci Am, July '82, pp. 151-154

Grinding glass by hand. Sci Am, Aug. '78, pp. 140-143, 148

How can we make a simple magnifying glass? This demonstration uses a drop of water as a magnifier. In: Nelson, Science, p. 84

Lens. In: Clarke, Encyclopedia of How It Works, pp. 131-133

Lens grinding. In: Clarke, Encyclopedia of How It's Made, pp. 93-95

Lenses made from ice. Sci Am, Apr. '83, pp. 132-134

Looking with lenses - several demonstrations. In: Richards, Science Magic, p. 38

Making a camera obscura incorporating a Fresnel lens. In: Wels, Science, pp. 71-72

Making a camera obscura, using a Fresnel lens. In: Wels, Science, pp. 60-62

Making a simple solar furnace (or camp cooker) using a Fresnel lens. In: Wels, Science, pp. 55-56 [compiler's note: figures 2 and 3 for these projects were missing in copy of book examined, although no pages were missing from the book]

Making a syrup magnifier. In: Herbert, Mr. Wizard's, p. 23

Making an overhead projector using a Fresnel lens. In: Wels, Science, pp. 58-59

Similarity between a convex lens and the eye. In: Baldini, Student Science Activities, pp. 128-129

Simple method of obtaining a rough measurement of focal lengths of diverging lenses and mirrors. Sci Teach, Oct. '81, p. 49

Turning an arrow around without touching it by looking at it through a glass of water. In: Goldstein-Jackson, Experiments, pp. 152-153

Water-drop magnifier. In: Herbert, Mr. Wizard's, p. 32

Water lens. In: Penrose, Dr. Zed's Brilliant, pp. 56-57

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Lever. In: Clarke, Encyclopedia of How It Works, p. 135

Two demonstrations of principles of the lever - hammer pulling a nail and lifting a weight with arms in different positions. In: Brown, 666 Science Tricks & Expts., pp. 375-376

LEYDEN JAR

How to make a pill box Leyden jar. In: Baldini, Student Science Activities, pp. 17-19

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Leyden jar. In: Graf, Safe And Simple, pp. 19-20

Leyden jar and an electrical tea trolley. In: Lanners, Secrets, pp.91-94

LIE DETECTORS AND DETECTION
Beginner's lie detector. Pop Elec, May '73, p. 76
Build a vocal "truth" analyzer. Pop Elec, Apr. '80, pp. 66, 68-71, and correction Jan. '81, p. 12

LIFE ON OTHER PLANETS
Can you devise a picture language that could be understood by an extraterrestrial intelligence? In: Simon, How to Be a Space Scientist, pp. 62-63

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Are all kinds of light rays the same? Demonstration uses a prism to produce a spectrum of colors from sunlight. In: Nelson, Science, p.81
Collimation tester. In: Kallard, Exploring, pp. 128-129
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Communicate over light beams with the first single-LED transceiver. Pop Elec, Mar. '74, pp. 66-70
Does light travel only in a straight line? In: Nelson, Science, p. 79
Electricity can produce heat and light. In: Graf, Safe and Simple, pp. 79-80
Experimenting with light-beam communications. Pop Elec, Apr. '75, pp. 40-42, and correction Aug. '75, p. 6
How bright is a star? Experiments with candles and light bulbs to investigate light intensity and its variation with distance, and the applicability to the study of stars. In: Rosenfeld, Science, pp. 149-157, 171
Light comparator, allowing adjustment of two light sources to equal intensity. In: Friedman, 99 Practical, pp. 55-56
MusicVision set - sound that you can see; this project employs a purchased music "motiondizer". In: Wels, Science, pp. 17-19
Rock music sound displayed as patterns of light, using a laser. Sci Teach, Oct. '76, pp. 43-44
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Trick light box. In: Brown, 666 Science Tricks & Expts., pp. 60-61
Visual display of sound dynamics using laser light. In: Kallard, Exploring, pp. 50-53

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LIGHT - SCATTERING
Dynamic scattering effect using laser light. In: Kallard, Exploring, pp. 163-164
Light scattering by milk particles. Sci Teach, Oct. '82, p. 51
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Why is a sunset red? Demonstration using a flashlight and some milk in water. In: Amery, KnowHow...Experiments, p. 21

LIGHT - SPEED
An amateur's version of A. A. Michelson's apparatus for measuring the speed of light. Sci Am, Oct. '75, pp. 120-126, 140

LIGHT - SPEED (continued)
Measurement of the speed of light using a laser beam. In: Kallard, Exploring, pp. 76-77

LIGHT - WAVE-LENGTH
Measuring the wavelength of light with a ruler. In: Kallard, Exploring, p. 201

LIGHT BULB
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LIGHT EMITTING DIODES
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LIGHT METER
See ELECTRIC METERS; PHOTOELECTRIC DEVICES

LIGHT PENS
Experimenting with a light pen, including instructions for a homemade light pen and light-pen data-entry circuit. Pop Elec, Dec. '80, pp. 80-82, and Jan. '81, pp. 86+

LIGHTNING
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Benjamin Franklin's storm-telling bells, and a modern version of them. In: Fox, Unique Electronic, pp. 106, 108-109
Device for measuring electricity in the atmosphere. In: Schaefer, A Field Guide, pp. 311-313
Solid-state whistler receiver. In: Fox, Unique Electronic, pp. 120-125
Use of photography in the atmosphere, particularly the photographing of clouds, with a short discussion of lightning photography. In: Schaefer, A Field Guide, pp. 313-316
What is lightning? Imitating lightning by producing static electricity by friction. Imitating thunder. In: Nelson, Science, p. 186

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The breath contains carbon dioxide - effect on limewater. In: Morgan, First Chemistry Book, pp. 136-137
- How do we detect carbon dioxide? Demonstration using limewater or slaked lime. In: Nelson, Science, p. 18
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MAGNESIUM SULPHATE

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Power megaphone. In: Carr, 104 Weekend, pp. 21-22
Power megaphone using a transistor. In: Friedman, 99 Practical, pp. 21-22

MELTING
See also FREEZING; FUSION, LATENT HEAT OF

Can a solid be made to change to a liquid? A liquid to a gas? In: Nelson, Science, p. 4

MELTING POINTS
See also FREEZING POINTS

Do all solids melt at the same temperature? In: Nelson, Science, p. 3

MENTAL SUGGESTION
Power of suggestion - inducing another person to scratch and cough by performing these activities. In: Brown, 666 Science Tricks & Expts., pp. 148-149

MERCURIC IODIDE
Chemical color reaction: "water" to orange and back again - mercuric chloride and potassium iodide form orange mercuric iodide. In: Chen, Entertaining, p. 13

MERCURIC OXIDE
How do we get elements from their compounds? Demonstration with mercuric oxide. In: Nelson, Science, p. 12
How to break a compound into elements - demonstration using mercuric oxide. In: Baldini, Student Science Activities, pp. 105-107

MERCURIC THIOCYANATE

MERCURIC THIOCYANATE
Pharaoh's serpents, made from mercuric thiocyanate. In: Chen, Entertaining, p. 53

MERCURY
See also ELECTRODES, DROPPING MERCURY; headings beginning with MERCURIC

Beating mercury heart - a surface tension effect. In: Chen, Entertaining, pp. 83-84
Dancing corks or glass chips in a sealed tube containing mercury. In: Chen, Entertaining, p. 89
Diffusion of mercury through lead by filtration. In: Chen, Entertaining, p. 87
Diffusion of mercury through lead by siphoning using lead came, and using the lead came containing mercury to demonstrate qualitative analysis for lead and mercury. In: Chen, Entertaining, pp. 87-89
Testing for "quicksilver" in air. Sci Teach, Nov. '78, pp. 35-36

METAL DETECTORS
Build an electronic metal locator. Pop Elec, Jan. '80, pp. 70, 72-75
"Coinshooter" metal detector. Pop Elec, Aug. '81, pp. 55-59
Low-cost metal detector. Pop Elec, July '74, pp. 47-49
Metal detector. In: Traister, First Book, pp. 40-43
Metal detectors. In: Clarke, Encyclopedia of How It Works, pp. 139-141

METAL IONS
How can the amateur detect metals in air, liquids or solids? Sci Am, Feb. '81, pp. 168-170, 173-176

METALS
See also, e.g., ALLOYS; METAL DETECTORS; MINERALOGY - TESTS; SOLDER AND SOLDERING; names of specific metals, e.g., IRON

Drops of water dance on a hot skillet; small pieces of heated metal dance on water; experimenter walks on hot coals - Leidenfrost effect. Sci Am, Aug. '77, pp. 126-131, 140

METALS - ANALYSIS
Heavy metal analysis - heavy metal concentration in a soil sample. Sci Teach, May '76, p. 49
How can the amateur detect metals in air, liquids or solids? Sci Am, Feb. '81, pp. 168-170, 173-176

METALS - DUCTILITY
Tensile strength and ductility tester and its use. In: Giant Handbook, pp. 227-231

METALS, EFFECT OF TEMPERATURE ON
Heat a piece of iron or steel wire over a gas burner in a darkened room to show successive color changes as temperature increases - analogy to various colors of star light. In: Simon, How to Be a Space Scientist, p. 65
Hot weight - demonstration to show expansion of a wire on heating and contraction on cooling. In: Brown, 666 Science Tricks & Expts., p. 277
How do heating and cooling change the length of a wire? In: Nelson, Science, p. 69

METALS, EFFECT OF TEMPERATURE ON (continued)

How does heat affect metals? Demonstration using a nail. In: Nelson, Science, p. 10

How does heat affect solids? Demonstration with a brass expansion ring and a brass expansion ball. In: Nelson, Science, p. 68

Loosening a stuck jar lid by heating. In: Brown, 666 Science Tricks & Expts., p. 289

Proving that metal expands when heated. In: Goldstein-Jackson, Experiments, pp. 98-99

Thermal expansion of metals - an improvised demonstration. Sci Teach, Oct. '81, p. 48

Thermostat device - construction and use; provides example of differential coefficient of expansion of two metals. Sci Teach, Oct. '74, pp. 38-40

METEORITES

See also METEORS

How to capture a comet. In: Greenleaf, Experiments in Space Science, p.100

How to gather stony micrometeorites. In: Greenleaf, Experiments in Space Science, p. 102

How to separate dust particles of earthly origin from particles of cosmic origin. In: Greenleaf, Experiments in Space Science, p. 101

Micrometeorite collecting. Sci Teach, Dec. '74, pp. 51-52

Simulation of meteorite craters and experimenting with crater formation using wet plaster of Paris, aluminum foil and plastic food wrap. In: Simon, How to Be A Space Scientist, p. 45

METEOROLOGICAL INSTRUMENTS

See also, e.g., METEOROLOGY; MOISTURE; PHOTOMETRY; and names of meteorological instruments, e.g., ANEMOMETER, BAROMETER, WEATHERVANES; and meteorological techniques, e.g., HYGROMETRY

Early warning electronic storm detector. Pop Elec, Sept. '73, pp. 31-34, and revised version, Aug. '74, pp. 94-95

Electronic thunderstorm/tornado detector and tornado alerter. In: Fox, Unique Electronic, pp. 110, 112-113, 116-117

Storm forecasting electronic circuit. Pop Elec, Apr. '75, pp. 68-69

Weather indicator - cardboard painted with cobalt chloride solution is a different color when wet and dry. In: Cherrier, Fascinating... Chemistry, p. 51

METEOROLOGY

See also, e.g., ATMOSPHERE; METEOROLOGICAL INSTRUMENTS; phenomena related to meteorology, such as AIR PRESSURE; ATMOSPHERIC TEMPERATURE; FOG; LIGHTNING; RAIN AND RAINFALL; SNOW; STORMS; THUNDERSTORMS; TORNADOES; WINDS

Air inversion diversion: a demonstration. Sci Teach, Nov. '76, pp. 40-41

Air pollution and weather: activities and demonstrations for science classes. Sci Teach, Dec. '73, pp. 38-44

Determining heating degree-days per year. In: Norton, Solar Energy, pp. 14-15

Directional homemade antenna for picking up images of cloud cover as photographed by weather satellites. Sci Am, Dec. '75, pp. 122-125, 148

METEOROLOGY

METEOROLOGY (continued)
Investigating the microclimate of a shopping mall. Sci Teach, Apr. '80, pp. 38-39
Satellite weather watch: inexpensive direct-readout ground station gives insight into weather satellites. Sci Teach, Apr. '82, pp.43-46
Soap bubbles for atmospheric studies - local air flow, turbulence, convection, bubbles experimented with in a cold chamber, etc. In: Schaefer, A Field Guide, pp. 290-293
Weather satellite's shortwave radio pictures picked up in the home. Sci Am, Jan. '74, pp. 114-120, 130
What plumes of smoke tell about the structure of the atmosphere. Sci Am, May '78, pp. 162, 164-168, 170-172

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See also METEORITES

Meteors and fireballs - notes on observation. In: Roth, Astronomy: A Handbook, pp. 409-417
Photographing meteors. In: Mayall, Skyshooting, pp. 31-40

METERS, ELECTRIC
See ELECTRIC METERS

METRONOME
Build a shirt-pocket metronome. Pop Elec, Apr. '74, pp. 69-70
Build the ultimate (electronic) metronome. Pop Elec, July '76, pp. 57-59, and correction Dec. '76, p. 8
Circuit for an electronic metronome. Pop Elec, June '73, p. 94
Electronic metronome circuit. Pop Elec, Feb. '76, pp. 93-94
Electronic metronome-timer. In: Friedman, 99 Practical, pp. 70-71
LED pendulum metronome. Pop Elec, Dec. '81, pp. 79-80, 82-83
Metronome. In: Clarke, Encyclopedia of How It Works, p. 147

MICHELSON INTERFEROMETER
See INTERFERENCE (LIGHT) AND INTERFEROMETERS

MICROCOMPUTERS
See COMPUTERS

MICROMETER
See also THICKNESS MEASUREMENT

Micrometer. In: Clarke, Encyclopedia of How It Works, pp. 148-149
Plane parallel plate as an optical micrometer, using laser light. In: Kallard, Exploring, pp. 66-67

MICROPHONE
AM wireless microphone. Pop Elec, June '74, p. 69
Budget two-channel microphone mixer using a transistor. In: Friedman, 99 Practical, p. 16
Carbon microphone converter using a transistor. In: Friedman, 99 Practical, pp. 11-12
Carbon mike preamplifier. In: Mendelson, 103 Simple, p. 52
Circuits for AM and FM band wireless microphones. Pop Elec, July '80, p. 83
Communications microphone preamplifier. In: Carr, 104 Weekend, pp. 10-11
FM wireless microphone. In: Friedman, 99 Practical, pp. 113-114

MICROPHONE (continued)

Field-electric transistor device for controlling input into two or more microphones feeding into a central location. In: Malcolm, How to Build Electronic Projects, pp. 110-112

Four-channel microphone mixer. In: Carr, 104 Weekend, pp. 1-5

High-output dynamic microphone made from a small dynamic loudspeaker. In: Mendelson, 103 Simple, p. 118

High-to-low impedance mike matcher, matching high-impedance microphones into low-impedance inputs. In: Mendelson, 103 Simple, p. 55

Hi-Z amplifier microphone mixer using an FET transistor. In: Friedman, 99 Practical, pp. 17-18

Hi-Z microphone preamplifier using a field-effect transistor (FET). In: Friedman, 99 Practical, p. 15

Low-to-high impedance mike matcher, matching a low-impedance microphone into a high-impedance input. In: Mendelson, 103 Simple, p. 54

Lo-Z microphone preamplifier. In: Friedman, 99 Practical, p. 20

Microphone. In: Clarke, Encyclopedia of How It Works, pp. 149-151

Microphone beeper to check out audio system. In: Friedman, 99 Practical, pp. 100-101

Microphone booster. In: Mendelson, 103 Simple, p. 18

Microphone preamplifier with high dynamic range. In: Mendelson, 103 Simple, p. 77

Simple single-transistor vhf wireless microphone circuit. Pop Elec, May '81, p. 84

Speaker microphone preamplifier. In: Friedman, 99 Practical, pp. 10-11

Wireless microphone broadcaster. In: Mendelson, 103 Simple, p. 15

Wireless phono oscillator attaches to phonograph cartridge and broadcasts in immediate vicinity of phonograph. In: Mendelson, 103 Simple, p. 16

MICROPROCESSORS

Designing with the 8080 microprocessor (6-part series). Pop Elec, Sept. '81, pp. 57+; Oct. '81, pp. 80+; Nov. '81, pp. 68+; Dec. '81, pp. 74+; Jan. '82, pp. 62+; and Feb. '82, pp. 69+; and correction Nov. '81, p.8

Light chaser: a microprocessor controller for light shows. Computers & Electronics, Oct. '83, pp. 70-71, 74-75

Microprocessor introduction and building microprocessor projects using an inexpensive product development system (3-part series). Pop Elec, May '80, pp. 41-44, 46-49; Nov. '80, pp. 61-62, 64-69, 74-75; and Jan. '81, pp. 68-69, 74-76

Use of inexpensive microprocessors in custom applications. Pop Elec, May '80, pp. 41+; Nov. '80, pp. 61+; Jan. '81, pp. 68+; and Feb. '81, pp.79+

MICROSCOPE AND MICROSCOPY

See also ELECTRON MICROSCOPE; PHOTOMICROGRAPHY

Microscope. In: Clarke, Encyclopedia of How It Works, pp. 152-158

Microscope - how it works. In: Papallo, What Makes It Work, pp. 44-45

Microtome - instrument to cut thin specimen sections for microscopic examination. In: Clarke, Encyclopedia of How It Works, pp. 158-159

Photomicrography of snow crystals. In: Schaefer, A Field Guide, pp. 297-300

Put some color in your microscope - producing colored specimens. Sci Teach, Jan. '83, pp. 21-25

MICROTOME

See MICROSCOPE AND MICROSCOPY

MICROWAVES

MICROWAVES
Personal microwave communications system - link for audio, video or data communications (3-part series). Pop Elec, Oct. '78, pp. 42-50; Nov. '78, pp. 71-72, 79-80; and Jan '79, pp. 70, 74-76; and addition July '79, p. 6

MIDGES
See FLIES

MILK
See also BUTTER; CHEESE; CREAM (DAIRY PRODUCT); YOGURT

Casein glue from milk. In: Herbert, Mr. Wizard's, p. 36
Chemistry and curds - curdling will likely result from boiling tomatoes with milk or cream; soda will neutralize acid from tomatoes. In: Brown, 666 Science Tricks & Expts., p. 324
Felt hats, buttons and umbrella handles from milk - the extraction of casein from milk. In: Morgan, First Chemistry Book, pp. 99-101
Light scattering by milk particles. Sci Teach, Oct. '82, p. 51
Make sour milk. In: Brown, 666 Science Tricks & Expts., p. 323
Secret writing with milk. In: Morgan, First Chemistry Book, pp. 97-98

MILK OF MAGNESIA
See MAGNESIUM HYDROXIDE

MILKWEED BUG, LARGE
Large milkweed bug - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 126-130

MINERAL WATERS
Determination of sodium, potassium, and calcium in mineral waters. In: Skoog, Fundamentals, p. 765 and chapter 25

MINERALOGY - TESTS
Tests, techniques and tips for mineral identification; flame tests, bead tests, tube tests, wet tests in test tubes, fluorescence and phosphorescence; a suggested testing procedure. In: Pough, Field Guide, pp. 58-68

MINERALS IN NUTRITION
What are good sources of vitamins and minerals? In: Nelson, Science, pp. 307-308

MIRRORS
See also, e.g., PERISCOPES; REFLECTION (OPTICS)

Approximating the radius of curvature of small concave mirrors using laser light. In: Kallard, Exploring, pp. 44-45
Burning mirror, or how to increase the sun's radiation enough to ignite paper - the basis of solar furnace operation. In: Cherrier, Fascinating... Physics, p. 38
Cabinet of mirrors - three-sided prism with reflecting surfaces facing inward. In: Lanners, Secrets, pp. 134, 136
Crazy mirrors - reflections from surfaces of different shapes. In: Richards, Science Magic, p. 33

MIRRORS (continued)
Demonstration of Lloyd's mirror fringes, using laser light. In: Kallard, Exploring, pp. 115-117
Demonstrations with mirrors: infinite images, mirrors at right angles, and how a mirror sends back images. In: Cherrier, Fascinating... Physics, pp. 36-37
Fun with inclined mirrors. In: Penrose, Dr. Zed's Dazzling, pp. 40-41
Magic mirror - two mirrors at right angles do not reverse a written message - double reflection. In: Shalit, Science, pp. 93-94
Mirror. In: Clarke, Encyclopedia of How It Works, pp. 159-160
Mirror images without mirrors. In: Lanners, Secrets, p. 134
Optical lever - measuring angular rotation of a mirror using laser beam reflection. In: Kallard, Exploring, pp. 43-44
The [platinum] magic mirror -- one-way mirrors. In: Lanners, Secrets, pp. 131, 134
Simple method of obtaining a rough measurement of focal lengths of diverging lenses and mirrors. Sci Teach, Oct. '81, p. 49

MIXTURES
See also, e.g., COLLOIDS; SEPARATION (TECHNOLOGY); SOLUTION (CHEMISTRY)

Bet you can't mix one quart and one quart and get two quarts - mixing rubbing alcohol and water. In: Cobb, Bet You Can't, p. 60
Black sun - the mixing of two liquids of different natures (India ink and gouache). In: Cherrier, Fascinating...Physics, p. 23
Demonstration to show that given volumes of water and rubbing alcohol when mixed will give a smaller total volume. In: Brown, 666 Science Tricks & Expts., pp. 336-337
Demonstration with water and glycerol - this curious demonstration suggests important concepts of viscous fluid flow, liquid diffusion and the nature of reversible reactions. Sci Teach, Jan. '73, p. 42
How can we separate a mixture of sugar and sand? In: Nelson, Science, p. 9
Investigating the mixing of different powders - they seem to have lives of their own. Sci Am, Sept. '82, pp. 206, 208, 211-212, 216, 218
What is a mixture? In: Nelson, Science, p. 8

MODEM
See ELECTRONIC APPARATUS AND APPLIANCES

MODULATION (ELECTRONICS)
Modulator for output of rf oscillators and generators. In: Friedman, 99 Practical, pp. 111-112

MODULATOR-DEMODULATOR (MODEM)
See ELECTRONIC APPARATUS AND APPLIANCES

MÖBIUS STRIP
Paper trick involving a Möbius strip (which is the second strip in this demonstration). In: Shalit, Science, pp. 61-63
Various mathematical puzzles, including some topological problems and three Möbius strip puzzles. In: Cobb, Bet You Can't, pp. 67-82

MOHR METHOD
See VOLUMETRIC ANALYSIS (CHEMISTRY)

MOIRÉ PATTERNS

MOIRÉ PATTERNS
Moiré effects. Sci Am, Dec. '78, pp. 182-183
Moiré patterns draw contours. Sci Am, Oct. '73, pp. 120-123, 132

MOISTURE
See also, e.g., CONDENSATION; EVAPORATION; HUMIDITY; HYGROMETRY; SOIL MOISTURE

Experiment with a human hair and moisture in the air. In: Rosenfeld, Science, pp. 121, 124
Making a moisture-detecting fish from cellophane. In: Goldstein-Jackson, Experiments, pp. 110-111
Moisture sensor circuit. Pop Elec, Apr. '75, p. 87

MOLDS (BOTANY)
Bread mold. In: Brown, 666 Science Tricks & Expts., pp. 104-105
Culturing bread mold. In: Baldini, Student Science Activities, pp. 164-165
Grow a fungus garden - growing molds. In: Brown, 666 Science Tricks & Expts., pp. 105-106
Growing molds. In: Stein, Science Book, pp. 79-80
Growing molds in tomato soup. In: Herbert, Mr. Wizard's, p. 17
How do molds reproduce? An experiment in growing mold on bread. In: Nelson, Science, p. 225
Malloch, Moulds: Their Isolation, Cultivation, and Identification -- includes 1. Moulds and their characteristics, pp. 3-4
2. Classification of moulds, pp. 5-12
3. Natural occurrence of moulds, pp. 13-22
4. Cultivation of moulds, pp. 23-32
5. Isolation of moulds, pp. 33-41
6. Contamination, pp. 42-45
7. Microscopy, pp. 46-49
8. Identification, pp. 50-89
Mold-culture medium. In: Brown, 666 Science Tricks & Expts., p. 105

MOLECULES
What are molecules? In: Nelson, Science, pp. 21-22

MOLECULES - MODELS
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How an amateur can construct a model of an enzyme molecule at modest cost. Sci Am, Jan. '76, pp. 124-128, 136
Molecular model construction. Sci Am, Feb. '73, pp. 110-112, 124
Pie plate mobile molecular models. In: Baldini, Student Science Activities, p. 83
Tinkertoy molecules. In: Baldini, Student Science Activities, pp. 84-85

MOMENTS OF INERTIA
Measuring the moment of inertia. Sci Teach, Apr. '78, pp. 49-51

MOMENTUM (MECHANICS)
See also ANGULAR MOMENTUM

Colliding marbles are almost perfectly elastic; momentum is transferred from one marble to another. In: Brown, 666 Science Tricks & Expts., p. 395

MOMENTUM (MECHANICS) (continued)
Distinguishing a hard boiled egg from a raw one by spinning. In: Cobb, Bet You Can't, p. 41
How fresh the egg? - egg becomes more buoyant as it ages; also, spinning eggs to distinguish hard boiled from raw ones. In: Brown, 666 Science Tricks & Expts., p. 329
Inertia and momentum - ten groups of experiments outlined. In: Brown, 666 Science Tricks & Expts., pp. 7-14
Raw and hard-boiled eggs can be distinguished by spinning - fluid momentum causes difference. In: Herbert, Mr. Wizard's p. 40
Telling raw from hard-boiled eggs without breaking the shells. In: Goldstein-Jackson, Experiments, pp. 80-81

MONOSODIUM GLUTAMATE
MSG - a flavor enhancer: experiment to demonstrate the effect of MSG on food flavor. In: Cobb, More Science Experiments, pp. 83-86

MOON
See also ECLIPSES, LUNAR; TIDES

Determination of lunar siderial period. Sci Teach, Sept. '74, pp. 41-42
Experiment to measure the size of the moon when it is at the horizon and when it is higher in the sky - shows that apparently larger size at the horizon is an optical illusion. In: Rosenfeld, Science, pp. 40, 43-45, 167
How to build a sighting apparatus and a radial chart to plot the moon's orbit. In: Greenleaf, Experiments in Space Science, pp. 41-43
How to find the moon's orbit in space using a star chart and a homemade transit instrument. In: Greenleaf, Experiments in Space Science, pp. 18-20, 57-58
How to find where the moon is in its orbit by observing its phases. In: Greenleaf, Experiments in Space Science, pp. 62-63
How to find where the moon would appear overhead during the year, using a homemade transit instrument. In: Greenleaf, Experiments in Space Science, pp. 18-20, 60-61
How to form your own moon surface. In: Greenleaf, Experiments in Space Science, pp. 66-67
How to measure the diameter of the moon using a homemade sighting apparatus. In: Greenleaf, Experiments in Space Science, pp. 41-43, 47-48
How to measure the orbital speed of the moon with a camera. In: Greenleaf, Experiments in Space Science, p. 59
How to measure the orbital speed of the moon with a homemade transit instrument. In: Greenleaf, Experiments in Space Science, pp. 18-20, 59
How to measure the siderial month using a homemade transit instrument. In: Greenleaf, Experiments in Space Science, pp. 18-20,55
How to measure the synodic month using a homemade transit instrument. In: Greenleaf, Experiments in Space Science, pp. 18-20, 52
How to plot on paper the synodic and siderial months. In: Greenleaf, Experiments in Space Science, p. 56
How to trace a curve similar to the moon's orbit around the earth. In: Greenleaf, Experiments in Space Science, pp. 39-40
Is the moon really larger on the horizon? Sci Teach, Feb. '82, pp.47-48
Measuring the distance to the moon by parallax. Sci Teach, Apr. '77, pp. 32-37
Measuring the width (diameter) of the moon with index cards and a yardstick. In: Rosenfeld, Science, pp. 40-45, 167
The moon - problems and ideas about lunar observations, conditions of visibility, lunar formations, optical observations, etc. In: Roth, Astronomy: A Handbook, pp. 264-288

MOON (continued)
Observing the rotation of the moon on its axis as viewed from outer space. In: Greenleaf, Experiments in Space Science, pp. 51-52
Photographing the moon. In: Mayall, Skyshooting, pp. 98-108
Plotting moonrise and set times. Sci Teach, Mar. '80, pp. 34-35, and correction May '80, p. 13
Plotting the moon's orbit around the sun. In: Greenleaf, Experiments in Space Science, pp. 44-46

MOON - ECLIPSES
See ECLIPSES, LUNAR

MOPEDS
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MORSE CODE
See also OSCILLATORS, ELECTRIC

Budget code practice oscillator using a transistor. In: Friedman, 99 Practical, pp. 50-51
Build a Morse-a-keyer -- automatically converts ASCII data into Morse characters. Pop Elec, Jan. '81, pp. 61-64, and Feb. '81, pp. 83-85
Code transmitter - allows sending code signals to a standard AM broadcast radio a short distance away. In: Traister, First Book, pp.49-51
Electronic keyer, designed to work with a semiautomatic key. In: Friedman, 99 Practical, pp. 52-53
Electronic Morse-a-Letter; automatically decodes Morse transmissions and displays them alphanumerically; also, how to interface Morse-a-Letter with the TV screen. Pop Elec, Jan. '77, pp. 37-43, and May '77, pp.64-65, and addition Nov. '77, p. 12
Electronic oscillator constructed with an integrated circuit helps operator practice Morse code. In: Malcolm, How to Build Electronic Projects, pp. 130-132
The Morse-a-word: LED readout displays words and numbers when Morse code is received. Pop Elec, Mar. '79, pp. 35-39, and Apr. '79, pp. 57-59, 64-66, and correction May '79, p. 6
Morse code transmitters - key completes circuit on sending transmitter, bulb lights up on receiving box; also table of Morse codes for letters and numbers. In: Amery, KnowHow...Magnets, pp. 32-35
Simple electronic keyer for sending Morse Code. Pop Elec, Aug. '76, pp.44-45
Simple telegraph (Morse Code for letters and numbers included). In: Chapman, Young Scientist, pp. 26-27

MORTAR
Mortar and concrete. In: Brown, 666 Science Tricks & Expts., p. 367

MOSQUITOES
The mosquito. In: Headstrom, Your Insect Pet, pp. 99-103, 145

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Moss garden in a dish. In: Millard, Plants for Kids, pp. 60-61

MOTHBALLS
Dancing mothballs - safe partners? Discussion of dangers of using mothballs. Sci Teach, May '82, pp. 26-28
Making mothballs rise and fall in a glass. In: Goldstein-Jackson, Experiments, pp. 120-121
Mothball frost - formation of mothball crystals on the inside of a jar. In: Herbert, Mr. Wizard's, p. 57

MOTHBALLS (continued)

Substances that sublime: mothballs. In: Brown, 666 Science Tricks & Expts., p. 368

MOTHS

See also BUTTERFLIES; CATERPILLARS

Bagworm moths - classification, life cycle, how to find bagworm moth bags, what you can observe. In: Stokes, Guide, pp. 332-336

Butterflies and moths, as pets in a jar. In: Simon, Pets, pp. 73-77, 90-91

Cardboard box cage for butterflies and moths. In: Roberts, You Can, pp. 15-17

Cattail moth - classification, life cycle, how to find the cattail moth larva, what you can observe. In: Stokes, Guide, pp. 328-331

Chokecherry tentmaker - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 172-176

Fall webworm (tiger moth larva) - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 243-247

How do caterpillars change to butterflies or how do larvae change into moths? Very general suggestions for a classroom project. In: Nelson, Science, p. 259

Milk carton cage for butterflies and moths. In: Roberts, You Can, pp. 18-19

Moths - some general information on moths and how they differ from butterflies. In: Roberts, You Can, p. 30

Pine-tube moth - classification, life cycle, how to find the pupa, what you can observe. In: Stokes, Guide, pp. 343-346

Plastic drinking glass cage for butterflies and moths. In: Roberts, You Can, pp. 9-14

The Promethea moth. In: Headstrom, Your Insect Pet, pp. 56-59, 142

Silk moths - classification, life cycle, how to find silk moth cocoons, what you can observe. In: Stokes, Guide, pp. 321-327

White-marked tussock moth - classification, life cycle, how to find cocoons, what you can observe. In: Stokes, Guide, pp. 337-342

Wire screen cage for butterflies and moths. In: Roberts, You Can, pp.20-21

Woolly bear (tiger moth caterpillar) - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 238-242

MOTION

See also, e.g., ACCELERATION (MECHANICS); BALLISTICS; FORCE AND ENERGY; JET PROPULSION; MOMENTUM (MECHANICS); PERPETUAL MOTION; ROTATIONAL MOTION; SPEED; VORTEX MOTION; and related headings

Cam (device to convert rotary to linear motion). In: Clarke, Encyclopedia of How It Works, pp. 35-36

Demonstrating recoil action with a potato. In: Goldstein-Jackson, Experiments, pp. 94-95

Demonstrations of Newton's First Law of Motion - inertia and motion. In: Rosenfeld, Science, pp. 55-63, 167

Demonstrations of Newton's Third Law of Motion - action and reaction. In: Rosenfeld, Science, pp. 65-75, 168

Driving home the laws of motion: determining the mass of a car, and verification of the centripetal acceleration formula. Sci Teach, Dec. '81, pp. 14-15

Experiments demonstrating Newton's Third Law of Motion - action/reaction - and including jet propulsion demonstrations with balloons. In: Gardner, Moving Right Along, pp. 75-83

Experiments in motion. In: Gardner, Moving Right Along, pp. 55-91

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MOTION (continued)
How do we see motion? Simple demonstration with a spinning card. In: Nelson, Science, p. 295
Motion puzzlers - thirty-three specific questions, with answers, about a wide variety of situations involving motion. In: Gardner, Moving Right Along, pp. 147-159
Newton's Third Law demonstrated using a swinging pendulum apparatus. In: Brown, 666 Science Tricks & Expts., p. 391
Paper-plate puzzle - if quarter slice of a paper plate is removed, how will a marble rolling around the plate move when it comes to the edge of the cut portion: demonstration of Newton's First Law of Motion. In: Herbert, Mr. Wizard's, p. 70
Physics of the follow, the draw and the massé (in billiards and pool). Sci Am, July '83, pp. 124-130

MOTION PICTURES
See MOVING PICTURES

MOTOR ABILITY
See also MUSCLES

Muscle habit - difficulty of patting and rubbing simultaneously. In: Brown, 666 Science Tricks & Expts., p. 101
Trick of the mind - deceptively heavy object causes mind to misdirect muscles. In: Brown, 666 Science Tricks & Expts., p. 104
Two demonstrations involving human muscle use - crumpling a newspaper and holding a paper clip steady on the edge of a knife. In: Cobb, Bet You Can't, pp. 104-105, 108-109

MOTORCYCLES
Headlight reminder - special alarm for cars and motorbikes. Pop Elec, Jan. '73, p. 86
Motorcycle physics - investigating concepts of physics using a motorcycle. Sci Teach, Jan. '83, pp. 40, 45-46
Solid-state turn indicators for mopeds. Pop Elec, May '79, pp. 71-72, and addition Aug. '79, p. 6

MOTORS
See also, e.g., ELECTRIC MOTORS; ENGINES; PADDLE WHEELS; PUMPING MACHINERY; TURBINES

Build an eddy current motor. In: Graf, Safe and Simple, pp. 68-69
Building a simple motor. In: Graf, Safe and Simple, pp. 67-68
Hydraulic motor. In: Lanners, Secrets, pp. 111-113
Motors in which magnets attract other magnets in apparent perpetual motion. Sci Am, Mar. '82, pp. 142, 147-150, 152, 154

MOULDS (BOTANY)
See MOLDS (BOTANY)

MOVING PICTURES
Flip-flop 'magic' moving pictures. In: Penrose, Dr. Zed's Brilliant, pp.4-5
Magic movies - creating moving picture effect by spinning a series of drawings. In: Richards, Science Magic, p. 32

MOVING PICTURES, TALKING
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MULTIVIBRATORS
CMOS astable/monostable multivibrator. In: Duncan, Adventures, pp. 14-16
CMOS dual bistable multivibrator. In: Duncan, Adventures, pp. 16-18
Dual astable/monostable multivibrator. In: Duncan, Adventures, pp. 10-13
Monostable, bistable and astable multivibrators using the TTL NAND gate. Pop Elec, June '76, pp. 102-103
Monostable multivibrator. Pop Elec, May '78, pp. 76-77

MUSCLES
See also MOTOR ABILITY; TENDONS

Build an electronic muscle feedback monitor. Pop Elec, May '75, pp.39-42, and corrections June '75, p. 7, and Sept. '75, p. 6
Experiments demonstrating muscle strength and activity: holding pencil at arm's length, "rising arms". In: Brown, 666 Science Tricks & Expts., pp. 99, 103
Two demonstrations involving human muscle use - crumpling a newspaper and holding a paper clip steady on the edge of a knife. In: Cobb, Bet You Can't, pp. 104-105, 108-109
Using an ergometer to measure muscle fatigue. Sci Teach, Jan. '74, pp.45-47

MUSHROOMS
Mushrooms. In: McPhee, Gardening, pp. [18-19]

MUSIC
MusicVision set - sound that you can see; this project employs a purchased music "motiondizer". In: Wels, Science, pp. 17-19
Rock music sound displayed as patterns of light, using a laser. Sci Teach, Oct. '76, pp. 43-44

MUSIC, ELECTRONIC
See ELECTRONIC MUSIC

MUSICAL INSTRUMENTS
Build a guitar sound intensifier. Pop Elec, July '74, pp. 45-46
Glass harmonica from drinking glasses. In: Brown, 666 Science Tricks & Expts., p. 53
Guitar construction. In: Clarke, Encyclopedia of How It's Made, pp.79-84
How can we make pop bottle music? In: Nelson, Science, p. 104
How clarinets and pianos work. In: How Things Work, pp. 42-47
Magic drinking straw flute. In: Penrose, Dr. Zed's Brilliant, pp. 46-47
Making a pin piano. In: Herbert, Mr. Wizard's, p. 82
Making an oboe-like instrument from a soda straw. In: Herbert, Mr. Wizard's, p. 66
Making musical instruments from bottles, plastic straws and other readily available items. In: Cherrier, Fascinating...Physics, p. 82
Music makers: xylophone, whistle pipe, and guitar. In: Richards, Science Magic, pp. 44-45
Paper-tube kazoo. In: Herbert, Mr. Wizard's, p. 74
Walther, Make Mine Music -- describes many kinds of musical instruments and tells how to make some of your own

MUSICAL INSTRUMENTS, ELECTRONIC
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Amplified superfuzz to add hard-rock sound to guitar amplifier. In: Friedman, 99 Practical, pp. 69-70
Build a computer music box peripheral. Pop Elec, Apr. '78, pp. 60-61, and addition July '79, p. 55

MUSICAL INSTRUMENTS, ELECTRONIC

MUSICAL INSTRUMENTS, ELECTRONIC (continued)

Build a super electronic music maker. Pop Elec, Nov. '80, pp. 83-87, and additions Apr. '81, p. 6

Build a tremolo adapter; add tremolo to an electric guitar or other electronic instrument. Pop Elec, Mar. '74, p. 40

Build a "wah-wah" pedal for special musical effects. Pop Elec, June '80, pp. 72-75

Build an envelope modification unit - can be used to vary attack, sustain, and decay of any electronic instrument. Pop Elec, July '79, pp. 65-67

Build "Cabonga", an electronic percussion synthesizer. Pop Elec, Aug. '77, pp. 39-42, and Sept. '77, pp. 76-80, and correction Nov. '77, p. 12

Constructing and playing a theremin. In: Mendelson, 103 Simple, pp. 101-102

Construction of a programmable music box. Pop Elec, Dec. '75, pp. 63-68, and Jan. '76, pp. 53-55

Electronic organ - will play one note at a time. In: Mendelson, 103 Simple, p. 30

Electronic wind chimes. Pop Elec, Apr. '73, pp. 51-55

Fuzz-box circuit changes tones of an electric guitar to sounds similar to those produced by an electronic music synthesizer. Pop Elec, Mar. '78, p. 79

Keying and vca circuits for electronic music instruments. Pop Elec, Jan. '75, pp. 60-63, and Feb. '75, pp. 37-39

Light/dark music maker, which produces musical tones according to amount of light falling on it. In: Mendelson, 103 Simple, p. 89

98¢ fuzzbox for guitar. In: Friedman, 99 Practical, pp. 68-69

One-octave tone generator. Pop Elec, Sept. '74, p. 93

Percussion instrument synthesizer. Pop Elec, Mar. '76, pp. 100-102

Solid-state fuzz box adds sound effects to electric guitar or bass. Pop Elec, June '78, pp. 44-45

Toy electronic organ circuit. Pop Elec, Dec. '74, pp. 79, 88

Two-octave electronic organ. In: Duncan, Adventures, pp. 28-31

MUSICAL PITCH

See also TONE

Electronic music pitch standards, including construction of a voltage-controlled oscillator with memory. Pop Elec, Jan. '74, pp. 39-43

How can we make pop bottle music? In: Nelson, Science, p. 104

Pitch generators for electronic music. Pop Elec, Feb. '74, pp. 98-101, and Mar. '74, pp. 50-53

Tone-burst generator using dual timer. Pop Elec, May '74, p. 83

Two pitch generators. Pop Elec, Oct. '73, p. 37

MUTUALISM

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NATURAL RESOURCES

Energy crisis mobile depicts balance between energy sources and their ultimate consumption. Sci Teach, Jan. '79, pp. 34-35

NEBULAE

Photographing star clusters and nebulae. In: Mayall, Skyshooting, pp. 77-84

NEON LAMPS
How neon works. In: How Things Work, pp. 32-35
Neon bulb flasher circuit. Pop Elec, June '75, p. 84
Neon glow lamp. Pop Elec, Dec. '76, pp. 111-113
Simplified combination tester and its use - can be a voltmeter or a neon test light. In: Giant Handbook, pp. 427-428

NERVES
See also NERVOUS SYSTEM

Constructing a model of nerve cell transmission. Sci Teach, Jan. '81, pp. 33-34, and addition Mar. '81, p. 10
Locating skin sensors. In: Stein, Science Book, pp. 168-170

NERVOUS SYSTEM
See also NERVES; REACTION TIME; REFLEXES

How fast are your nerve signals? Simple pinch test. In: Brown, 666 Science Tricks & Expts., p. 131
What's your tenseness level? Interactive "biobox" connected to TRS-80 color computer enables you to monitor tenseness and experiment with biofeedback. Computers & Electronics, Feb. '83, pp. 77-79, 84, and addition June '83, p. 6

NEUTRALIZATION (CHEMISTRY)
Chemistry and curds - curdling will likely result from boiling tomatoes with milk or cream; soda will neutralize acid from tomatoes. In: Brown, 666 Science Tricks & Expts., p. 324
"Excess stomach acid treatment" - a chemistry laboratory project. Sci Teach, Dec. '73, p. 48, and comments Feb. '74, p. 49 and Feb. '75, p.61
Make a salt from vinegar and baking soda. In: Brown, 666 Science Tricks & Expts., p. 354
Preparation and standardization of reagents for neutralization titrations. In: Skoog, Fundamentals, pp. 729-731, and also chapters 9, 10 and 11, as indicated
Slow neutralization of 'stomach' acid - colorful demonstration with an antacid tablet. Sci Teach, Sept. '81, p. 53
When an acid meets a base; neutralizing an acid. In: Morgan, First Chemistry Book, pp. 115-120

NEWTON'S CRADLE
See FORCE AND ENERGY

NEWTON'S FIRST LAW OF MOTION
See INERTIA (MECHANICS); MOTION

NEWTON'S RINGS
See INTERFERENCE (LIGHT) AND INTERFEROMETERS

NEWTON'S SECOND LAW OF MOTION
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NEWTON'S THIRD LAW OF MOTION
See JET PROPULSION; MOTION; ROCKETS (AERONAUTICS)

NEWTS
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NICKEL
Electrogravimetric analysis: determination of copper in an aqueous solution, and separation and determination of copper and nickel in alloys. In: Skoog, Fundamentals, pp. 756-758
Electroplating of nickel and of copper. In: Giant Handbook, pp. 266-269
Gravimetric determination of nickel in steel. In: Skoog, Fundamentals, p. 725
How to electroplate copper and nickel on leaves. Sci Teach, Oct. '74, pp. 42-45
Nickel-plating. In: Morgan, Adventures in Electrochemistry, p. 244

NITROGEN COMPOUNDS
See also AMINES; AMMONIUM COMPOUNDS; PROTEINS; and other specific chemical compounds or classes of compounds containing nitrogen

Determination of ammonium ion by titration. In: Skoog, Fundamentals, pp. 244-247 and 734-735
Kjeldahl analysis for organic amine nitrogen - procedure suitable for analysis of protein. In: Skoog, Fundamentals, pp. 244-246 and 734-735

NITROGEN DIOXIDE
Le Chatelier's principle - pressure effects: demonstration with nitrogen dioxide. Sci Teach, Feb. '73, p. 57

NITROGEN TRIIODIDE
Nitrogen triiodide monoammine is formed; very explosive when dry. In: Chen, Entertaining, pp. 67-68

NOBILI'S RINGS
See ELECTROLYSIS

NOISE
Build a low-cost white/pink noise generator. Pop Elec, Feb. '80, pp. 67+
Build a pink noise generator for audio testing. Pop Elec, July '77, p. 66
Experimenting with noise - making electronic noise generators. Pop Elec, Mar. '80, pp. 80-82, and comments Nov. '80, p. 9 and Nov. '81, pp. 91-92
Noise generator. In: Carr, 104 Weekend, pp. 87-88
Wideband noise generator. Pop Elec, Dec. '76, p. 28

NONELECTROLYTES
See also ELECTROLYTES

Inexpensive apparatus allowing qualitative comparison of conductivities of various electrolytes and nonelectrolytes. Sci Teach, May '82, p. 52
Several experiments to determine whether pure water and water with a variety of dissolved substances are good electrical conductors. Instructions on building homemade testing apparatus. In: Morgan, Adventures in Electrochemistry, pp. 43-52

NOVAE (ASTRONOMY)
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NUCLEIC ACIDS
Schematic diagram of the reproduction of a short strand of DNA. In: Stein, Science Book, pp. 250-251

NUMBERS
See also, e.g., FIBONACCI NUMBERS; MATHEMATICAL RECREATIONS; MATHEMATICS; the various headings beginning with NUMBERS; NUMERATION

Cyclic numbers. In: Gardner, Mathematical Circus, pp. 111-122
Magic numbers. In: Shalit, Science, pp. 21-24
Numerical palindromes. In: Gardner, Mathematical Circus, pp. 242-245, 251-252

NUMBERS, RANDOM
Electronic pseudorandom number generators. Pop Elec, Dec. '79, p. 98, and comment Mar. '80, p. 6, and additional article Apr. '80, p. 94

NUMBERS, THEORY OF
Aleph-null and aleph-one: infinities in mathematics. In: Gardner, Mathematical Carnival, pp. 27-40

NUMERATION
See also, e.g., ABACUS; BINARY SYSTEM (MATHEMATICS); COMPUTERS; DECIMAL SYSTEM (MATHEMATICS); ELECTRONIC CALCULATING MACHINES; HEXADECIMAL SYSTEM (MATHEMATICS); headings beginning with NUMBERS; OCTAL SYSTEM (MATHEMATICS); SLIDE RULE

Binary, octal and hexadecimal numbers - how to understand and apply the three basic numbering systems in computer programming. Pop Elec, Mar. '81, pp. 63-66
Digital electronic counter counts from zero to 999. In: Giant Handbook, pp. 466-468
Four-bit binary counter circuit counts to 15 and total shown as four binary digits. In: Duncan, Adventures, pp. 52-55
In/out counter circuit allows counting people entering an area. Pop Elec, Mar. '82, p. 102
Number systems for microcomputers: how binary, octal, and hexadecimal systems work in relation to your computer. Computers & Electronics, Dec. '83, pp. 47-53, 55
Special counter circuits for experimenters. Pop Elec, Sept. '80, pp. 98-101

NUTRITION
See also, e.g., headings beginning with FOOD; MINERALS IN NUTRITION; PLANTS - NUTRITION; PROTEINS; VITAMINS

How to make worm cookies step-by-step; using worms as food, and how worms and other insects measure up as sources of protein. In: Taylor, Kids' Whole Future Catalog, p. 75
Nutrition: a number of activities relating to nutrition, such as investigations of digestion of carbohydrates, and testing foods for fat. Some of the more substantial activities are indexed separately. In: Nelson, Science, pp. 302-311
What's for lunch? - analysis of a school lunch. Sci Teach, Apr. '83, pp. 48-52

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OCTAL SYSTEM (MATHEMATICS)
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Binary, octal and hexadecimal numbers - how to understand and apply the three basic numbering systems in computer programming. Pop Elec, Mar. '81, pp. 63-66
Number systems for microcomputers: how binary, octal, and hexadecimal systems work in relation to your computer. Computers & Electronics, Dec. '83, pp. 47-53, 55

ODOMETER
How far did you cycle today? Electronic odometer indicates distance traveled in miles on a three-decade liquid-crystal display. Pop Elec, May '80, pp. 71-74, and addition Oct. '80, p. 8
Vitruvius' odometer. Sci Am, Oct. '81, pp. 188-190, 193-196, 198, 200, 238

OHMMETER
Auto polarity, auto zero digital multimeter. Pop Elec, Dec. '74, pp. 33-37, and correction Mar. '75, p. 6
Build the minivolter which can also be used as an ohmmeter and an ammeter. Pop Elec, Apr. '75, pp. 46-47
Linear scale ohmmeter. Pop Elec, Jan. '75, p. 90, and addition May '75, pp. 78-80
Linear-scale ohmmeter for accurate readings - zero to 10 megohms in seven ranges plus three ranges of dc millivolts. Pop Elec, Sept. '73, pp. 51-56

OHM'S LAW
Circuit layout for demonstration of Ohm's Law. In: Giant Handbook, pp.144-145

OILS AND FATS
See also FAT

Freezing - experiment with olive oil to show that the oil freezes from the bottom, whereas water ice floats. In: Brown, 666 Science Tricks & Expts., pp. 278-279

OPHTHALMOSCOPE
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OPTICAL ILLUSIONS
Ames window tunnel: appearance vs. reality. Sci Teach, Mar. '77, pp. 47-48
Bet you can't fit a penny on this drawing of a table - optical illusion. In: Cobb, Bet You Can't, p. 100
Candle burning in water - illusion involving reflection. In: Brown, 666 Science Tricks & Expts., p. 82
Demonstrations involving optical illusions. In: Brown, 666 Science Tricks & Expts., pp. 291-292, 298, 300-301
The devil in reverse [afterimages]. In: Lanners, Secrets, pp. 139-140
Experiment to measure the size of the moon when it is at the horizon and when it is higher in the sky - shows that apparently larger size at the horizon is an optical illusion. In: Rosenfeld, Science, pp. 40, 43-45, 167
The fade-over effect ["irradiation"]. In: Lanners, Secrets, pp. 140-141

OPTICAL ILLUSIONS (continued)

Funnels roll "uphill". In: Herbert, Mr. Wizard's, p. 60

Gyrating, warping and stretching circles and ellipses; Musatti effects. Sci Am, June '75, pp. 116, 118

Hexagonal circles. In: Lanners, Secrets, p. 137

How tall is the top hat? In: Lanners, Secrets, pp. 142, 144-145

Illusions in the "snow": more fun with random dots on the television screen. Sci Am, May '80, pp. 176, 179-182, 184, 186

Interpretation of visual illusions, and including diagrams of several illusions. Sci Am, Dec. '83, pp. 154, 156-157, 159-162, 178

It's an illusion! Five optical illusions. In: Richards, Science Magic, pp. 30-31

Making an optical-illusion cube. Sci Am, Nov. '74, pp. 130-132

Nine optical illusions. In: Shalit, Science, pp. 72-81

Optical illusion - apparent relative sizes of X and O. In: Brown, 666 Science Tricks & Expts., pp. 79-80

Optical illusions. In: Gardner, Mathematical Circus, pp. 3-15

Optical illusions with the help of a ruler. In: Lanners, Secrets, p. 145

Paper-plate illusion - illusion involving lengths of arcs cut from edges of the paper plate. In: Herbert, Mr. Wizard's, p. 69

Seven drawings that show that the human eye can be fooled. In: Rosenfeld, Science, pp. 37-39, 45, 167

Several optical illusions. In: Stein, Science Book, pp. 205-209

Short history of optical illusions, types of optical illusions, and some illustrations. In: Wels, Science, pp. 87-90

Some eye tricks. In: Amery, KnowHow...Experiments, pp. 12-13

Two drawings which create optical illusions - concentric circles & staircase. In: Brown, 666 Science Tricks & Expts., pp. 107-108

Visual illusions in random-dot patterns and television "snow". Sci Am, Apr. '80, pp. 172-176, 178, and continuation, including computer programs to generate random dots, Sci Am, Nov. '80, pp. 198-199, 203-204, 206, 208, 210, and addition July '81, pp. 186-187

Visual illusions that can be achieved by putting a dark filter over one eye; Pulfrich pendulum illusion and other visual latency experiment discussions. Sci Am, Mar. '78, pp. 142-143, 146, 148-154, and addition July '81, pp. 186-187

OPTICAL ROTATION

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Demonstration that a molecule with a spiral structure rotates the plane of plane-polarized light. Sci Teach, Oct. '82, pp. 51-52, and comment Jan. '83, p. 10

OPTICS

See also, e.g., ABSORPTION OF LIGHT; COLOR; DIFFRACTION; FIBER OPTICS; INTERFERENCE (LIGHT) AND INTERFEROMETERS; LENSES; LIGHT; MIRRORS; PHOTOMETRY; POLARIZATION (LIGHT); REFLECTION (OPTICS); REFRACTION; headings beginning with SPECTRO; SPECTRUM (LIGHT) AND SPECTRUM ANALYSIS; and other related headings

Optics experiments with liquid crystals, using laser light. In: Kallard, Exploring, pp. 101-110

The reverse image; experiment with the eye and a pinhole in a card. In: Lanners, Secrets, pp. 119-121

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Determining Mars' synodic period. Sci Teach, Oct. '75, pp. 39-40

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How to build a sighting apparatus and a radial chart to plot the moon's orbit. In: Greenleaf, Experiments in Space Science, pp. 41-43
How to find the moon's orbit in space using a star chart and a homemade transit instrument. In: Greenleaf, Experiments in Space Science, pp. 18-20, 57-58
How to find where the moon is in its orbit by observing its phases. In: Greenleaf, Experiments in Space Science, pp. 62-63
How to plot the planets' orbits with the aid of a star chart. In: Greenleaf, Experiments in Space Science, p. 72
How to trace a curve similar to the moon's orbit around the earth. In: Greenleaf, Experiments in Space Science, pp. 39-40
Plotting the moon's orbit around the sun. In: Greenleaf, Experiments in Space Science, pp. 44-46
What is the shape of an orbit? In: Rosenfeld, Science, pp. 127-137, 170

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ORGANIC SALTS
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ORIENTATION
Finding directions using the sun and a watch. In: Nelson, Science, p.155
How to find east and west. In: Baldini, Student Science Activities, p. 49
How to find north during the day without a compass. In: Baldini, Student Science Activities, p. 48

OSCILLATORS
See also FREQUENCIES OF OSCILLATING SYSTEMS

Thermal oscillators: systems that seesaw, buzz or howl under the influence of heat. Sci Am, Feb. '83, pp. 146-148, 151-154

OSCILLATORS, CRYSTAL
AM aligner. In: Carr, 104 Weekend, pp. 240-241
Crystal-controlled oscillator to test whether a crystal is good. Pop Elec, Mar. '73, pp. 72-73
Crystal oscillator. Pop Elec, Jan. '74, p. 68
Crystal oscillator. Pop Elec, June '74, pp. 68-69
FET crystal-controller oscillator. Pop Elec, Nov. '74, pp. 90-91
FM aligner. In: Carr, 104 Weekend, pp. 239-240
Ham aligner - basically a crystal marker oscillator. Useful in setting the dial on a receiver or transmitter. In: Carr, 104 Weekend, pp. 230-232
100 KHz crystal calibrator. In: Carr, 104 Weekend, pp. 82-84
1000 KHz crystal calibrator. In: Carr, 104 Weekend, pp. 84-85
Transistor/crystal checker. In: Carr, 104 Weekend, pp. 229-230
27-MHz crystal oscillator (output 4mW). In: Mendelson, 103 Simple, p. 95
Universal crystal calibrator set. In: Carr, 104 Weekend, pp. 85-87
Venerable clock is made highly accurate by equipping it with quartz-crystal works. Sci Am, Sept. '74, pp. 192-198, 212, and correction Nov. '74, p. 134

OSCILLATORS, ELECTRIC
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Astable oscillator (frequency = 7000 Hz). In: Mendelson, 103 Simple, p.83
Astable pulse oscillator circuit with wide variety of applications. Pop Elec, May '76, pp. 80-81
Audio amplifier/code practice oscillator. In: Mendelson, 103 Simple, p.9
Audio oscillator, can provide single tone sine-wave output at any frequency to well above 100 kHz. In: Mendelson, 103 Simple, pp.48-49
Beat frequency oscillator. In: Mendelson, 103 Simple, p. 104
Broadcast band CW transmitter, for use as a code practice oscillator or for short distance communications. In: Mendelson, 103 Simple, pp.123-124
Budget code practice oscillator using a transistor. In: Friedman, 99 Practical, pp. 50-51
Clorox powered oscillator. In: Mendelson, 103 Simple, p. 56
Code practice oscillator. In: Giant Handbook, pp. 324-327
Code practice oscillator. In: Carr, 104 Weekend, pp. 109-111
Code-practice oscillator. In: Mendelson, 103 Simple, p. 39
Code practice oscillator. Pop Elec, June '74, p. 68
Code practice oscillator using the 555 IC timer. Pop Elec, July '74, pp. 50-51
Code practice oscillator, with schematic diagram. In: Giant Handbook, pp. 293-295
Electronic flasher, connecting the output of an oscillator to a light bulb. In: Traister, First Book, pp. 45-46
Electronic music pitch standards, including construction of a voltage-controlled oscillator with memory. Pop Elec, Jan. '74, pp. 39-43
Electronic oscillator constructed with integrated circuit helps operator practice Morse code. In: Malcolm, How to Build Electronic Projects, pp. 130-132
FM alignment oscillator. In: Friedman, 99 Practical, pp. 109-110
General-purpose audio oscillator. Pop Elec, Sept. '74, pp. 81-82
"Grid-dip" meter (3.5 to 100 MHz) to determine frequency of resonant circuits. In: Mendelson, 103 Simple, pp. 71-72
High-volume oscillator. In: Traister, First Book, pp. 30-32
How to design solid-state oscillators. Pop Elec, Oct. '75, pp. 61-64
Modulator for output of rf oscillators and generators. In: Friedman, 99 Practical, pp. 111-112
Multifunction VMOS oscillator. Computers & Electronics, Jan. '83, p. 113
Mystifying motion - an audio oscillator able to turn itself on and off. In: Mendelson, 103 Simple, p. 96
1000 Hz blitzit - a square wave for troubleshooting dead radios. In: Carr, 104 Weekend, pp. 237-238
Rf-powered sidetone oscillator. In: Carr, 104 Weekend, pp. 120-121
SSB test oscillator. In: Mendelson, 103 Simple, p. 14
Simple oscillator can be used as a tone generator or as a code-practice generator. In: Traister, First Book, pp. 43-44
Simple pulse generator. In: Carr, 104 Weekend, pp. 62-64
Sine wave audio oscillator. In: Carr, 104 Weekend, pp. 232-233
Sine wave generator. In: Mendelson, 103 Simple, p. 88
Square-wave oscillator. Pop Elec, Feb. '75, pp. 77-78
Square-wave oscillator circuit. Pop Elec, Sept. '77, pp. 87+
Square-wave oscillator circuit. Pop Elec, Sept. '80, pp. 115-116
Square-wave oscillator using a 555 IC timer chip. Pop Elec, Jan. '74, p. 74, and additional comment Dec. '74, p. 7
Three-way tone generator from a code practice oscillator. In: Friedman, 99 Practical, pp. 56-57
Voltage-controlled oscillator circuit with RAM's synthesizes waveshapes. Computers & Electronics, July '83, pp. 67-68, 70

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OSCILLATORS, ELECTRIC (continued)
Voltage-controlled oscillator with sine, triangle, square-wave and pulse outputs - for electronic music. Pop Elec, Mar. '77, pp. 42-44
Wien bridge oscillator. Pop Elec, Jan. '74, pp. 101-103

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OSCILLOGRAPH
Budget oscilloscope calibrator. In: Friedman, 99 Practical, pp. 122-123
CB scope booster - output from CB transmitter can be viewed on oscilloscope. In: Friedman, 99 Practical, pp. 107-108
Experimental solid-state oscilloscope. Pop Elec, Apr. '79, pp. 93-95
"Matchbox" LED oscilloscope. Pop Elec, Aug. '79, pp. 78-79
Oscilloscope calibrator. In: Carr, 104 Weekend, pp. 155-157
Oscilloscope can display alphanumerics with character generator. Pop Elec, Aug. '74, pp. 33-38
Oscilloscope graphic artist. Pop Elec, Nov. '75, pp. 53-57
Oscilloscope time-base calibrator. In: Friedman, 99 Practical, pp. 94-95
Play video games on your oscilloscope. Pop Elec, Dec. '79, pp. 56-58
Solid-state oscilloscopes. Pop Elec, Jan. '80, pp. 77-80
Turn your TV screen into an oscilloscope. Pop Elec, Sept. '82, pp. 63+
Vertical-input oscilloscope calibrator. In: Friedman, 99 Practical, pp. 95-96

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Building an osmometer. In: Baldini, Student Science Activities, pp. 152-153
Detailed examination of a "store-bought" (unfertilized) egg, and a study of osmosis in a chicken egg. Sci Teach, May '74, pp. 54-55
Eggsperiment - effect of putting a raw unshelled egg into vinegar. In: Brown, 666 Science Tricks & Expts., p. 356
How do roots absorb water? Demonstration of osmosis using a carrot. In: Nelson, Science, p. 217
Osmosis - a demonstration using an egg. Sci Teach, Sept. '77, p. 38
Osmosis in plants - laboratory exercise using the water plant Elodea. Sci Teach, Feb. '78, p. 33
Swelling fruit. In: Brown, 666 Science Tricks & Expts., pp. 187-188
Swollen egg. In: Brown, 666 Science Tricks & Expts., p. 334
Using sliced cucumbers to demonstrate osmosis, and the effect of salt solutions on cells. In: Brown, 666 Science Tricks & Expts., pp. 315-316

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Magic ink chemical trick using tannin, ferric chloride and oxalic acid. In: Shalit, Science, p. 47
Photochemical reduction of iron(III) by oxalic acid. In: Chen, Entertaining, p. 57

OXIDATION
See also OXIDATION-REDUCTION REACTION; REDUCTION, CHEMICAL

Forming of a benzoic acid tree by autooxidation of benzaldehyde. In: Chen, Entertaining, pp. 81-82
How does heat affect metals? Demonstration using a nail. In: Nelson, Science, p. 10
Oxidation demonstrated through the rusting of steel wool. In: Baldini, Student Science Activities, pp. 96-97
Oxidize iron in a jar, then test the jar with a lighted candle. In: Brown, 666 Science Tricks & Expts., p. 347
Vitamin E as an antioxidant. In: Cobb, More Science Experiments, pp. 72-74
What is iron rust? Demonstration of the rusting of iron. In: Nelson, Science, p. 14

OXIDATION-REDUCTION REACTION
See also OXIDATION; REDUCTION, CHEMICAL

Chemical color reactions involving oxidation-reduction indicators - reactions using methylene blue, resazurin solution, indophenol, benzoin, indigo carmine and phenanthrenequinone in various demonstrations. In: Chen, Entertaining, pp. 37-43
Preparation and use of a Jones reductor in connection with oxidation-reduction titrations. In: Skoog, Fundamentals, pp. 739-740
Two redox reaction experiments: percentage of hydrogen peroxide in drugstore hydrogen peroxide solution, and analysis of vitamin C (ascorbic acid) in citrus juice. Sci Teach, Apr. '74, p. 47

OXYGEN
See also WATER - ELECTROLYSIS

Burning powdered sulfur in a jar of oxygen. In: Morgan, Adventures in Electrochemistry, p. 216
Can chlorella (a form of algae) be a source of oxygen in space travel? In: Greenleaf, Experiments in Space Science, p. 112
Candle-in-a-jar demonstration to show how oxygen is consumed by a flame: the traditional explanation of this experiment is incorrect. Sci Teach, Apr. '81, p. 23
Chlorine breaks up water molecules and liberates oxygen - oxidizing action of sodium hypochlorite solution is speeded up by a small amount of vinegar (acid). In: Morgan, First Chemistry Book, pp. 153-154
Combustible iron wire - burns in oxygen. In: Cherrier, Fascinating... Chemistry, p. 68
Constructing a closed system using a water plant such as elodea, water, and two or three pond snails - simulating a closed system in space travel. In: Simon, How to Be a Space Scientist, pp. 56-57
Demonstrations with bleach: bleach art and demonstrating that oxygen is liberated by bleach. In: Herbert, Mr. Wizard's p. 45
Determining the percentage of oxygen in air using a candle and an inverted jar. In: Baldini, Student Science Activities, pp. 95-96 (but see "Candle-in-a-jar" item in this section as well)
Do fires need oxygen? Extinguishing a candle flame by covering the candle with a glass jar. In: Nelson, Science, p. 75
Do plants growing in water give off oxygen? In: Nelson, Science, p. 233
Do plants in sunshine give off oxygen? In: Nelson, Science, p. 234
Easy oxygen from hydrogen peroxide and baking soda. In: Brown, 666 Science Tricks & Expts., pp. 361-362
Electrolysis of water produces oxygen and hydrogen gas. In: Morgan, Adventures in Electrochemistry, pp. 188-195

OXYGEN

OXYGEN (continued)
Electrolytic cell for producing larger quantities of oxygen and hydrogen. In: Morgan, Adventures in Electrochemistry, pp. 204-208
Experiments with oxygen: a test for oxygen (glowing splinter); when carbon burns in oxygen, carbon dioxide is formed. In: Morgan, Adventures in Electrochemistry, pp. 211-215
Fires require oxygen. Experiment with a candle in an inverted jar sitting in a pan of water. In: Morgan, First Chemistry Book, pp. 71-77
How can we show that the body uses oxygen? In: Nelson, Science, p. 288
How leaves give off oxygen. In: Baldini, Student Science Activities, pp. 140-141
How much oxygen is in the air? In: Nelson, Science, p. 45
How to prove that the bubbles in the electrolysis of water are oxygen and hydrogen. In: Morgan, First Chemistry Book, pp. 57-64
Making and testing oxygen with household chemicals. In: Baldini, Student Science Activities, pp. 93-95
Oxygen from hydrogen peroxide. In: Brown, 666 Science Tricks & Expts., p.336
Oxygen in the air - estimating the proportion of oxygen in the air through the rusting of steel wool. In: Simon, Projects, pp. 51-52
Oxygen is a fire-maker -- making oxygen with hydrogen peroxide and manganese dioxide. In: Morgan, First Chemistry Book, pp. 73-75
Preparation of oxygen from hydrogen peroxide, and the effect of manganese dioxide as a catalyst. Sci Teach, Sept. '73, p. 52
Rust - demonstration of oxygen consumption in the rusting of steel wool. In: Tuey, How to Be, pp. 10-11
What happens when the oxygen in the air is used up? Simple demonstration with candles, matches and jars. In: Nelson, Science, p. 338
You can separate water into oxygen and hydrogen in your home laboratory. In: Morgan, First Chemistry Book, pp. 53-57

PACEMAKER (MEDICAL APPARATUS)
See MEDICAL INSTRUMENTS AND APPARATUS

PADDLE WHEELS
Turbines and paddle wheels - simple structures from foil. In: Richards, Science Magic, p. 50

PAGER (RADIO)
See RADIO - TRANSMITTERS AND TRANSMISSION

PAINT
Crystallizing paint is useful in creating psychedelic slides, color wheels and other special effects accessories. In: Wels, Science, pp. 79-80
How can we make different colors with paints? Discovering which combinations of paint colors yield other colors. In: Nelson, Science, p.91
Paint manufacture. In: Clarke, Encyclopedia of How It's Made, pp. 112-117

PAINTING
See also ART

Painting pictures with bubbles. In: Goldstein-Jackson, Experiments, pp. 134-135

PAPER
See also WATERMARKS

Charge a piece of paper. In: Graf, Safe and Simple, pp. 4-5
Copper-plating a piece of paper. In: Morgan, Adventures in Electrochemistry, pp. 243-244
Demonstrations of the strength of paper. In: Richards, Science Magic, p. 17
How strong is paper? Sci Teach, Mar. '82, pp. 64-65
Light-sensitive paper -- how to make it and use it. In: Cherrier, Fascinating...Chemistry, pp. 45, 52-55
Making heat-sensitive paper using cobalt chloride - paper changes color on heating. In: Cherrier, Fascinating...Chemistry, p. 51
Papermaking. In: Clarke, Encyclopedia of How It's Made, pp. 117-122

PAPER CHROMATOGRAPHY
Circular paper chromatography with pie plates; can be used to separate a mixture of amino acids. Sci Teach, Feb. '83, pp. 54-55
Experiment in paper chromatography using a coffee filter or piece of paper toweling. In: Herbert, Mr. Wizard's, p. 26
Paper chromatography demonstration with ink and a paper towel. In: Brown, 666 Science Tricks & Expts., p. 362

PARABOLA
Simple technique for making reasonably accurate paraboloids. Sci Am, Nov. '74, pp. 127-128

PARABOLIC REFLECTORS
See REFLECTORS, PARABOLIC

PARABOLOID
See PARABOLA

PARAFFINS
Freezing of water and paraffin - expansion or contraction? In: Brown, 666 Science Tricks & Expts., p. 289

PARALLAX
How far is a star? In: Rosenfeld, Science, pp. 139-147, 170
Measuring the distance to the moon by parallax. Sci Teach, Apr. '77, pp. 32-37

PARTICLES
Catching large aerosol particles in the atmosphere. In: Schaefer, A Field Guide, pp. 296-297
Detection of submicroscopic particles in a sample of air applying the principle of the Wilson Cloud Chamber; how to make an inexpensive demonstration or observation chamber. In: Schaefer, A Field Guide, pp. 293-296
Particles in the air - collection and counting. In: Simon, Projects, pp. 56-57

PEANUTS
Heat you can eat - laboratory exercise to determine the amount of heat produced by burning a peanut. Sci Teach, May '82, pp. 52-53

PEDOMETER

PEDOMETER
Electronic pedometer for joggers, using a pocket calculator. Pop Elec, Aug. '79, pp. 42-43, and additions Feb. '80, p. 6 and Apr. '80, p. 7

PEN (WRITING INSTRUMENT)
See WRITING
See also LIGHT PENS

PENDULUM
See also FOUCAULT'S PENDULUM

Compound pendulum. In: Brown, 666 Science Tricks & Expts., pp. 386-387
Do you dare? Demonstration with a pendulum to demonstrate the law of conservation of energy. In: Brown, 666 Science Tricks & Expts., pp.80-81
Experimenting with the potential and kinetic energy of a pendulum. Sci Teach, Oct. '73, p. 31
How to photographically record the path of a luminous pendulum. In: Cherrier, Fascinating...Physics, pp. 49-50
Lissajous figures made with a pendulum. Sci Am, Aug. '73, pp. 109, 116
Magnetic pendulum. Sci Teach, Oct. '73, p. 46
Making a static electricity pendulum. In: Graf, Safe and Simple, p. 24
Newton's Third Law demonstrated using a swinging pendulum apparatus. In: Brown, 666 Science Tricks & Expts., p. 391
Pendulum activities, including patterns produced by a swinging pendulum. In: Richards, Science Magic, p. 7
Physics with flashers - a good, cheap, accurate, easy-to-use flashing light source and its use in physics experiments involving pendulums, acceleration, and velocity. Sci Teach, Sept. '83, pp. 42-44, 49
Pendulum as a time device. In: Baldini, Student Science Activities, pp. 52-54
Pendulums. In: Brown, 666 Science Tricks & Expts., pp. 35-36
Pendulums, including a simple pendulum, coupled pendulums and a spring pendulum; also some theoretical discussions on pendulums and energy. In: Gardner, Moving Right Along, pp. 92-100, 129
Simple pendulum. In: Gardner, Moving Right Along, pp. 57-58
Wilberforce pendulum - provides excellent demonstration of energy transformations. Sci Teach, Apr. '74, p. 46

PERISCOPES
The amazing periscope. In: Penrose, Dr. Zed's Dazzling, pp. 24-25
How can we make a periscope? In: Nelson, Science, p. 80
Making a simple periscope. In: Richards, Science Magic, p. 36
Making a simple periscope. In: Tuey, How to Be, pp. 24-27

PERMANGANATES
Preparation and standardization of permanganate solutions. In: Skoog, Fundamentals, pp. 339-346 and 740-741

PEROXIDES
See HYDROGEN PEROXIDE

PERPETUAL MOTION
Perpetual motion machine using the principle of capillary action - does it work? In: Gardner, Moving Right Along, pp. 130-131

PESTS - CONTROL

Digitally programmed "varmint zapper" delivers a penetrating yet harmless electric shock. Pop Elec, June '80, pp. 64-66, and correction Sept.'80, p. 6

PHARAOH'S SERPENTS

See COMBUSTION; MERCURIC THIOCYANATE

PHENOLPHTHALEIN

See INDICATORS AND TEST PAPERS

PHENOLS

Determination of phenol by bromine substitution. In: Skoog, Fundamentals, pp. 752-753 and also pp. 350-353 and other pages referred to in experimental instructions

PHONOGRAPH

See also SOUND - RECORDING AND REPRODUCING; STEREOPHONIC SOUND SYSTEMS

Build a direct-drive turntable. Pop Elec, Dec. '75, pp. 41-45

Cleaning your records electrostatically. In: Graf, Safe and Simple, p. 35

Electronic project which logs the number of hours on a phono stylus. Pop Elec, Dec. '80, pp. 45-49, and correction Feb. '81, p. 7

Line-powered phonograph amplifier - useful for updating vacuum tube type phonographs. In: Friedman, 99 Practical, pp. 18-19

1-watt AC/DC phonograph amplifier. In: Mendelson, 103 Simple, pp. 33-34

RIAA phonograph preamplifier. In: Carr, 104 Weekend, pp. 7-8

Record player. In: Clarke, Encyclopedia of How It Works, pp. 183-186

Wireless phono oscillator attaches to phonograph cartridge and broadcasts in immediate vicinity of phonograph. In: Mendelson, 103 Simple, p. 16

PHOSPHATES

Potentiometric titration of a phosphate mixture. In: Skoog, Fundamentals, pp. 753, 755

PHOSPHENES

About phosphenes: luminous patterns that appear when the eyes are closed. Sci Am, May '81, pp. 174, 176, 178, 180, 183-184, 186, and comments Dec. '81, pp. 176, 178

PHOSPHINE

See PHOSPHORUS COMPOUNDS

PHOSPHORUS

"Barking dogs" chemical reaction (spontaneous combustion), using white phosphorus. In: Chen, Entertaining, p. 65

Spontaneous combustion - red phosphorus and bromine. In: Chen, Entertaining, p. 48

Spontaneous combustion - red phosphorus and potassium chlorate. In: Chen, Entertaining, p. 48

Yellow phosphorus and potassium chlorate tablet used to produce explosion. In: Chen, Entertaining, pp. 66-67

PHOSPHORUS COMPOUNDS

Spontaneous combustion - phosphine gas in air. In: Chen, Entertaining, p. 47

PHOTOCHEMISTRY

PHOTOCHEMISTRY

Iron-thionine photogalvanic cell. Sci Teach, May '75, pp. 51-52
Photochemical reduction of iron(III) by oxalic acid. In: Chen, Entertaining, p. 57
Photochemical reduction of thionin. In: Chen, Entertaining, pp. 57-58
Reversible photochemical changes involving thiourea. In: Chen, Entertaining, p. 59

PHOTOELECTRIC CELLS

See also REMOTE CONTROL; SOLAR BATTERIES

Cadmium-sulfide cell. In: Traister, First Book, p. 54
How to make an experimental cuprous oxide photoelectric cell. In: Morgan, Adventures in Electrochemistry, pp. 250-256
The solar cell. In: Traister, First Book, pp. 52-54
Solid-state photocells for hobbyists. Pop Elec, June '74, pp. 48-51 and July '74, pp. 64-66

PHOTOELECTRIC DEVICES

Build a light probe. Pop Elec, Mar. '73, pp. 42-43
Build a photometer/enlarger exposure meter. Pop Elec, May '75, pp. 48-51
Build the "light genie" - handheld photoelectric system turns electrical equipment on or off. Pop Elec, Apr. '77, pp. 57-59
Cadmium-sulfide cell light meter. In: Traister, First Book, pp. 60-62
Circuit produces audible signal after short exposure to light. Pop Elec, Mar. '81, p. 92
Constructing a two-way optoisolator. Computers & Electronics, May '83, p. 96
Dark/light detector. Pop Elec, Feb. '80, p. 113
Electric eye alarm - when light is interrupted a warning alarm sounds. In: Mendelson, 103 Simple, p. 112
Electric-eye annunciator, using the 555 IC timer. Pop Elec, July '74, p. 51
Iron-thionine photogalvanic cell. Sci Teach, May '75, pp. 51-52
Light-beam receiver. In: Giant Handbook, pp. 288-292
Light-beam transmitter. In: Giant Handbook, pp. 292-294
Light beam transmitter (a flashlight), and receiver (the phototube and amplifier of a 16mm sound projector). In: Giant Handbook, pp. 326-328
Light controlled relay. In: Mendelson, 103 Simple, p. 19
Light-controlled switch, may be used to turn lights and alarms on and off. In: Mendelson, 103 Simple, p. 62
Light/dark music maker, which produces musical tones according to the amount of light falling on it. In: Mendelson, 103 Simple, p. 89
Light meter - how it works. In: Papallo, What Makes It Work, pp. 116-117
Light meter using a solar cell. In: Traister, First Book, pp. 55-56
Light meters and other photoelectric devices. Pop Elec, June '77, pp. 90-91
Light operated relay. In: Carr, 104 Weekend, pp. 153-155
Light-sensitive tone generator. Pop Elec, Dec. '81, p. 106
Measuring light with an easily constructed photoelectric device. Sci Teach, Oct. '83, pp. 59-61
Photo relay (operates with light increase). In: Mendelson, 103 Simple, p. 106
Photoelectric control. Pop Elec, June '74, p. 69
Photoelectric sensor detects (and counts) entrances & exits. Pop Elec, Jan. '77, pp. 48-50, and addition Aug. '77, p. 6
Photonic door and window intrusion alarm. Computers & Electronics, Feb. '83, p. 118

PHOTOELECTRIC DEVICES (continued)

Phototransistor receiver module. Pop Elec, Jan. '79, p. 82

"Seeing aid for the blind" - circuit which provides audible signal of pitch which changes with different light levels. Pop Elec, June '75, pp. 65-66

Solid-state photocells for hobbyists. Pop Elec, June '74, pp. 48-51 and July '74, pp. 64-66

Using LED's (light emitting diodes) as light detectors. Pop Elec, May '77, pp. 86-88

PHOTOGRAPHY

See also, e.g., ASTRONOMICAL PHOTOGRAPHY; CAMERAS; KIRLIAN PHOTOGRAPHY; PHOTOMICROGRAPHY; SCHLIEREN PHOTOGRAPHY; STEREOSCOPE

Anamorphic photography: distorted views created and from which distortion can be removed. Sci Am, July '81, pp. 176-177, 180, 182, 185-186, 188

The cannibal [composite photograph]. In: Lanners, Secrets, p. 149

The man in the bottle [composite photograph]. In: Lanners, Secrets, pp. 145-148

Photographic compositions [composite photographs]. In: Lanners, Secrets, pp. 152-155

"Special effects" photography, including psychedelic slides, kaleidoscope photos, mirror tricks, and diffraction grating slides. In: Wels, Science, pp. 46-52

Taking photographs up close. Sci Teach, May '82, pp. 23-25, and corrections and additions Oct. '82, pp. 60-61

Your head on a platter [composite photograph]. In: Lanners, Secrets, pp. 151-152

PHOTOGRAPHY - APPARATUS AND SUPPLIES

See also CAMERAS; LENSES

Automatic electronic photo enlarger controller. Pop Elec, Apr. '74, pp. 51-53, 58, and correction June '74, p. 9

Build a digital camera shutter timer. Pop Elec, Aug. '77, pp. 59, 64-66, and corrections Nov. '77, p. 12 and Dec. '77, p. 6

Build a digital darkroom timer. Pop Elec, Aug. '78, pp. 47-51

Build a photometer/enlarger exposure meter. Pop Elec, May '75, pp.48-51

Build an enlarger timer. Pop Elec, Feb. '73, p. 103, and correction Apr. '73, p. 8

Camera timer for time-lapse photography. Pop Elec, Nov. '81, pp. 65-67

Enlarger exposure calculator. Pop Elec, Nov. '73, pp. 72-75

Enlarging meter. In: Friedman, 99 Practical, p. 75

Homebuilt photographic enlargers. Sci Teach, Mar. '76, pp. 34-35

IC photo development timer. Pop Elec, Oct. '73, pp. 70-71

3-way electronic photo flash tripper for novel stop-action effects. Pop Elec, July '74, pp. 52-53

Zoom lens. In: Clarke, Encyclopedia of How It Works, pp. 243-244

PHOTOGRAPHY - DEVELOPING AND DEVELOPERS

Build a photo darkroom sink sentinel - serves as photo-lab timer, thermometer, and conductivity tester. Pop Elec, Feb. '80, pp. 50-52, 56-57, and addition June '80, p. 6

IC photo development timer. Pop Elec, Oct. '73, pp. 70-71

Photographic processing. In: Clarke, Encyclopedia of How It's Made, pp. 122-126

PHOTOGRAPHY - EXPERIMENTS

PHOTOGRAPHY - EXPERIMENTS

Simple optical experiments in which spatial filtering removes the "noise" from pictures; process using laser light is based on diffraction and interference of light waves. Sci Am, Nov. '82, pp. 194, 198, 198B, 199, 202-204, 204B-206

PHOTOGRAPHY - FILMS

See also MOVING PICTURES; PROJECTORS AND PROJECTION

Making slides from black-and-white negatives. Sci Teach, Feb. '75, pp. 54, 56

Light-sensitive paper - how to make it and use it. In: Cherrier, Fascinating...Chemistry, pp. 45, 52-55

Spectral pictures - magnetic field produced with a magnet and iron filings and image of this field produced using drawing paper covered with a photosensitive substance. In: Cherrier, Fascinating...Physics, pp. 13-14

PHOTOGRAPHY - LIGHTING

Air flash lamp advances color schlieren photography. Sci Am, Aug. '74, pp. 104-109, 116

Automatic remote (slave) flash control circuit. Pop Elec, Nov. '77, pp. 74-75

Build the poor man's strobe - allows timed, sequential flashes for multiple photographic exposures of moving subjects. Pop Elec, June '81, pp.63-67

Exposure meter. In: Clarke, Encyclopedia of How It Works, pp. 93-94

500-watt photoflood dimmer. In: Friedman, 99 Practical, p. 74

Light meter circuit for photographers. Pop Elec, Aug. '77, pp. 72-73

Photo flash - how it works. In: Papallo, What Makes It Work, pp. 56-57

Photoflash slave unit. In: Carr, 104 Weekend, pp. 159-160

Slave flash tripper. In: Friedman, 99 Practical, pp. 72-73

Slave flash unit. In: Mendelson, 103 Simple, pp. 35-36

Sound-activated photo flash: simple circuit freezes split-second action. Pop Elec, May '82, p. 69

Stop-motion flash tripper. In: Friedman, 99 Practical, p. 76

PHOTOGRAPHY - SCIENTIFIC APPLICATIONS

See also ASTRONOMICAL PHOTOGRAPHY; PHOTOMICROGRAPHY

Demonstrating fluid flow using polarized light, and photographing fluid motion. Sci Am, Feb. '80, pp. 162, 164, 167-168, 170, 172

How to photographically record the path of a luminous pendulum. In: Cherrier, Fascinating...Physics, pp. 49-50

Remote sensing simulation activities for Earthlings. Sci Teach, Apr. '77, pp. 42-43

Shutterbug techniques for the science classroom. Sci Teach, Nov. '76, pp. 23-25

Spectral pictures - magnetic field produced with a magnet and iron filings and image of this field produced using drawing paper covered with a photosensitive substance. In: Cherrier, Fascinating...Physics, pp. 13-14

Use of photography in the atmosphere, particularly the photographing of clouds, with a short discussion of lightning photography. In: Schaefer, A Field Guide, pp. 313-316

PHOTOGRAPHY, ANAMORPHIC

See PHOTOGRAPHY

PHOTOGRAPHY, ASTRONOMICAL
See ASTRONOMICAL PHOTOGRAPHY

PHOTOGRAPHY, KIRLIAN
See KIRLIAN PHOTOGRAPHY

PHOTOGRAPHY, STEREOSCOPIC
Simulating satellite stereophotography. Sci Teach, Oct. '79, pp. 38-40
Stereoscope making and stereoscopic photography. Sci Am, Dec. '78, pp. 184-186, 188, and further comments June '79, pp. 195, 198

PHOTOMETRY
See also COLOR; FLAME PHOTOMETRY

Build a photometer/enlarger exposure meter. Pop Elec, May '75, pp.48-51
Construction of the Volz sun photometer - used to determine coefficient of atmospheric turbidity. In: Norton, Solar Energy, pp. 46-51
Light meter - how it works. In: Papallo, What Makes It Work, pp. 116-117
Light meters and other photoelectric devices. Pop Elec, June '77, pp.90-91
Measuring atmospheric turbidity by means of a sun photometer and demonstrating that small particles suspended in the atmosphere reduce visibility by increasing turbidity. In: Norton, Solar Energy, pp. 37-45
Measuring light with an easily constructed photoelectric device. Sci Teach, Oct. '83, pp. 59-61
Oil spot on paper can be used as a simple photometer to compare the relative brightness of light sources. In: Herbert, Mr. Wizard's, pp. 42-43
Photometry of stars and planets. In: Roth, Astronomy: A Handbook, pp. 439-471

PHOTOMICROGRAPHY
See also MICROSCOPE AND MICROSCOPY; PHOTOGRAPHY; PHOTOGRAPHY - SCIENTIFIC APPLICATIONS; PROJECTORS AND PROJECTION

How to make dazzling photomicrographs with simple and inexpensive equipment. Sci Am, Jan. '79, pp. 152-156, 158-160, 164
Instant photomicrographs. Sci Teach, Dec. '77, p. 34
Micro-video taping. Sci Teach, Jan. '81, p. 37
Photomicrography of snow crystals. In: Schaefer, A Field Guide, pp. 297-300
Photomicrography with a pen microscope and camera; expense is no more than that for ordinary photography. In: Wels, Science, p. 45

PHOTOPHONE
Photophone. Pop Elec, Apr. '80, pp. 74-76
Talk over a sunbeam with a "photophone". Pop Elec, Feb. '76, pp. 54-55, 60-61

PHOTOTROPISM
Phototropism in animals - fruit flies and yellow mealworms. Sci Teach, Nov. '79, p. 39

PHTHALATES (CHEMISTRY)
Analysis of weak acids by titration, including determination of potassium hydrogen phthalate in an impure sample and analysis of vinegar for its acid content. In: Skoog, Fundamentals, pp. 731-732

PHYSICAL CHEMISTRY
See CHEMISTRY, PHYSICAL AND THEORETICAL

PHYSICAL MEASUREMENTS

PHYSICAL MEASUREMENTS
See also, e.g., DISTANCES - MEASUREMENT; ELECTRIC METERS; THICKNESS MEASUREMENT; TIME MEASUREMENTS; TRIANGULATION; VOLUME (CUBIC CONTENT); and other related headings

Bragg, Principles of Experimentation and Measurement
-includes the following:
1. The place of experimentation and measurement in science and technology, pp. 1-6;
2. Defining the problem, pp. 7-19;
3. The mechanics of measurement, pp. 20-31;
4. Statistics, pp. 32-71;
5. Treatment of results, pp. 72-104;
6. Reporting results, pp. 105-135;
7. Example reports, pp. 136-162

-this book is mathematically beyond high school level. Much of the material is accessible, however, and the bright student will find the material a challenge

Propagation of uncertainty - dealing with significant digits in calculations. In: Zebrowski, Fundamentals of Physical Measurement, pp. 113-116

Zebrowski, Fundamentals of Physical Measurement
-deals at quite an advanced level with topics such as measurement error, significant figures, statistics, data tables and graphs. Would be of use to the keen senior high school student

PHYSICS
See also, e.g., BALLISTICS; CAPILLARITY; CHEMISTRY, PHYSICAL AND THEORETICAL; DIFFUSION; ELECTRICITY; EVAPORATION; FLUID DYNAMICS; FORCE AND ENERGY; FRICTION; GASES; GRAVITATION; HEAT; LIGHT; LIQUIDS; MAGNETISM; MATTER; MECHANICS; METEOROLOGY; MOTION; OPTICS; PLANCK'S CONSTANT; POWER (MECHANICS); RADIATION; SOUND; THERMODYNAMICS; VISCOSITY; WORK (MECHANICS); and other specific physics terms

Rising hourglass and other physics puzzles. In: Gardner, Mathematical Carnival, pp. 173-193

PHYSICS - EXPERIMENTS
Motorcycle physics - investigating concepts of physics using a motorcycle. Sci Teach, Jan. '83, pp. 40, 45-46

Physics with flashers - a good, cheap, accurate, easy-to-use flashing light source and its use in physics experiments involving pendulums, acceleration, and velocity. Sci Teach, Sept. '83, pp. 42-44, 49

Using the bicycle to investigate principles of physics. Sci Teach, Sept. '83, pp. 35-37

PHYSIOLOGY
See also, e.g., ADAPTATION (BIOLOGY); ANATOMY, HUMAN; BIOFEEDBACK; BIOLOGICAL RHYTHMS; BODY TEMPERATURE; DIGESTION; DIZZINESS; ELECTROPHYSIOLOGY; HEARING; MOTOR ABILITY; NERVOUS SYSTEM; REACTION TIME; REFLEXES; RESPIRATION: SENSES AND SENSATION; SMELL; TASTE; TOUCH; VISION; VOICE; names of organs, e.g., HEART; and other related headings

PHYSIOLOGY (continued)
Body structure and function. A series of quite simple classroom activities for studying various aspects of body activity and structure. In: Nelson, Science, pp. 280-288
How can we show that the body uses oxygen? In: Nelson, Science, p. 288

PIANO
See MUSICAL INSTRUMENTS

PIEZOELECTRICITY
See PYRO- AND PIEZOELECTRICITY

PITCH OF SOUND
See MUSICAL PITCH; SOUND; TONE

PITOT TUBE
See FLUID DYNAMICS

PLANARIA
See TURBELLARIA

PLANCK'S CONSTANT
Experiment to measure Planck's constant. Sci Am, Jan. '83, pp. 132, 134-135

PLANETARIA
Cereal-box planetarium. In: Herbert, Mr. Wizard's, p. 12

PLANETS
See also ARTIFICIAL SATELLITES; LIFE ON OTHER PLANETS; MECHANICS, CELESTIAL; SOLAR SYSTEM; names of specific planets, e.g., MARS (PLANET)

Graphs that predict when planets will line up with other planets or with the sun. Sci Am, Aug. '75, pp. 116-119, 128
How fast do the planets travel around the sun? Sci Teach, May '83, p. 50
How to plot the planets' orbits with the aid of a star chart. In: Greenleaf, Experiments in Space Science, p. 72
How to plot the planets with a camera. In: Greenleaf, Experiments in Space Science, p. 71
Observation of the planets, including discussion of individual planet observation and photography of the planets. In: Roth, Astronomy: A Handbook, pp. 348-392
Photographing planets. In: Mayall, Skyshooting, pp. 109-117
Photometry of stars and planets. In: Roth, Astronomy: A Handbook, pp. 439-471
Scale model of the planets (1" = 10,000 miles). In: Baldini, Student Science Activities, pp. 56-57
Scale of distances for the planets. In: Baldini, Student Science Activities. pp. 54-56
What would you weigh on the planets? In: Baldini, Student Science Activities, pp. 57-58

PLANT ANATOMY
See BOTANY - ANATOMY

PLANT DISEASES
The oak gall - observation, collection, chemistry. In: Baldini, Student Science Activities, pp. 190-194

PLANT LICE

PLANT LICE
See APHIDS

PLANT STRUCTURE
See BOTANY - ANATOMY

PLANTS
See also, e.g., BOTANY - ANATOMY; FERTILIZATION OF PLANTS; FLOWERS; GARDENS; GEOTROPISM; GERMINATION; GROWTH (PLANTS); HERBARIUMS; HYDROTROPISM; LEAVES; PHOTOTROPISM; ROOTS (BOTANY); SEEDS; SUCCULENT PLANTS; TERRARIUMS; TREES; VIVARIUMS; names of specific plants, e.g., IVY, POTATOES, PUMPKIN; headings beginning with PLANT; and related headings

Air pollution experiment - the effect of sulphur dioxide on plant life. Sci Teach, Jan. '73, pp. 38-39
Do all plants like the same kind of soil? Experiment with four kinds of soil. In: Nelson, Science, p. 210
Experiment with the biological time clocks of plants. In: Simon, Secret Clocks, pp. 63-65
Investigating houseplants: new shoot in biology. Sci Teach, Feb. '78, pp. 31-32
Research project involving comparison of the shapes of life forms observed in a drop of pond water with design forms in contemporary art. Sci Teach, Sept. '81, pp. 24-25

PLANTS - ABSORPTION OF WATER
See also PLANTS - WATER REQUIREMENTS

Experiment in the absorption of water by a celery stalk. In: Herbert, Mr. Wizard's, p. 90
How does water move in plants? Experiment with absorption of colored water by carrots, celery, flowers. In: Nelson, Science, p. 229
Simple experiment to find the rate of water uptake in a shoot. Sci Teach, Oct. '81, p. 48
Turning a white rose red and blue. In: Goldstein-Jackson, Experiments, pp. 114-115
Waterways of plants. In: Amery, KnowHow...Experiments, p. 27

PLANTS - COLLECTION AND PRESERVATION
See also HERBARIUMS; LEAVES

How are plant mounts made? In: Nelson, Science, p. 247
One useful method of preserving (and mounting) botanical material. Sci Teach, Feb. '82, p. 54

PLANTS - MOTION OF FLUIDS
See PLANTS, MOTION OF FLUIDS IN

PLANTS - NUTRITION
See also HYDROPONICS

Minerals from the earth - comparing plants watered with water which has been passed through soil with those watered with distilled water; also varying growing soils. In: Brown, 666 Science Tricks & Expts., pp. 113-114

PLANTS - REPRODUCTION
Everything's coming up violets: cloning in the classroom. Sci Teach, Oct. '78, pp. 43-44
Layering, a method of plant reproduction. In: Brown, 666 Science Tricks & Expts., pp. 119-121
New plants from leaves. In: Brown, 666 Science Tricks & Expts., pp. 114-115

PLANTS - RESPIRATION
Demonstration of carbon dioxide absorption by plants. In: Baldini, Student Science Activities, pp. 141-142
Do plants growing in water give off oxygen? In: Nelson, Science, p. 233
Do plants in darkness give off carbon dioxide? In: Nelson, Science, p. 235
Do plants in sunshine give off oxygen? In: Nelson, Science, p. 234
How leaves give off oxygen. In: Baldini, Student Science Activities, pp. 140-141

PLANTS - SOILLESS CULTURE
See HYDROPONICS

PLANTS - TRANSPIRATION
See also PLANTS - WATER REQUIREMENTS

Do plants give off water? In: Nelson, Science, p. 230
How to observe that plants give off water through their leaves. In: Baldini, Student Science Activities, pp. 143-144
Water from leaves. In: Brown, 666 Science Tricks & Expts., p. 101
Waterways of plants. In: Amery, KnowHow...Experiments, p. 27

PLANTS - WATER REQUIREMENTS
See also PLANTS - ABSORPTION OF WATER

How can we prove plants need water? In: Nelson, Science, p. 227
How much water a plant uses. In: Baldini, Student Science Activities, pp. 147-149

PLANTS, EFFECT OF LIGHT ON
Bean maze experiment, testing effects of light and gravity on growth. In: Stein, Science Book, pp. 98-99
Do plants grow toward light? In: Nelson, Science, p. 232
Do plants need sunshine? Experiment involving masking a part of a growing leaf. In: Nelson, Science, p. 220
How does light affect germination? In: Nelson, Science, p. 215
How green plants react to sunlight. In: Baldini, Student Science Activities, pp. 146-147
Is light necessary for continued growth of plants? In: Nelson, Science, p. 231
Phototropism - plants will grow toward the brighter light. In: Brown, 666 Science Tricks & Expts., p. 141

PLANTS, EFFECT OF TEMPERATURE ON
Freezing of plant tissue. In: Brown, 666 Science Tricks & Expts., p. 112
How does temperature affect growth? In: Nelson, Science, p. 236

PLANTS, FERTILIZATION OF
See FERTILIZATION OF PLANTS

PLANTS, MOTION OF FLUIDS IN

PLANTS, MOTION OF FLUIDS IN

How you can see the water-carrying tubes of a plant. In: Baldini, Student Science Activities, p. 140

Turning a white rose red and blue. In: Goldstein-Jackson, Experiments, pp. 114-115

Waterways of plants. In: Amery, KnowHow...Experiments, p. 27

PLASTER OF PARIS

See also LIME

Plaster of Paris sets when its water of crystallization returns. In: Morgan, First Chemistry Book, pp. 49-52

Reaction of plaster of Paris with water to form gypsum - experiment suitable for the visually impaired. Sci Teach, Oct. '81, p. 51

Water is a part of some crystal structures - experiment using washing soda to demonstrate water of hydration. Also discussion of plaster of Paris. In: Morgan, First Chemistry Book, pp. 46-50

PLASTICS

Bubbles blown from organic polymers survive for years. Sci Am, July '73, pp. 110-115, 122

Caustics: mathematical curves generated by light shined through rippled plastic - formed when light reaches a surface by refraction or reflection. Sci Am, Sept. '83, pp. 190-191, 195-197, 199-202

Plastics manufacture. In: Clarke, Encyclopedia of How It's Made, pp. 126-129

Viewing stresses in plastic materials. Sci Teach, Mar. '83, p. 66

PLATING

See also ELECTROPLATING

Chemical silvering of glass. Sci Teach, Jan. '75, p. 36

POISONS

Alarm for toxic gases. Pop Elec, Sept. '81, pp. 79-80, and correction Feb. '82, p. 12

Poisoned air detector - low-cost sensor sounds alarm with as little as 50ppm of most toxic gases. Pop Elec, Feb. '74, pp. 55-56

Portable gas leak meter. Pop Elec, Aug. '79, pp. 41-42

POLARISCOPE

See also OPTICAL ROTATION

Polariscope as a measuring instrument and as a means of creating objects of art. Sci Am, July '74, pp. 122-126, 136

Simple polariscope. Sci Am, June '75, pp. 114, 116

POLARITY (ELECTRICITY)

See also INDICATORS AND TEST PAPERS

Automatic polarity protection circuit. In: Traister, First Book, pp.24-26

Chemical polarity indicator shows which wire is positive and which negative when connected to a direct current source. In: Morgan, Adventures in Electrochemistry, p. 268

Current reverser device - can be used as a dimmer for small bulbs and other lighting devices. In: Mendelson, 103 Simple, p. 74

How can we determine which is the positive pole of a battery? Potato used in this demonstration. In: Nelson, Science, p. 128

POLARITY (ELECTRICITY) (continued)

Polarity tester to protect electronic circuitry. In: Friedman, 99 Practical, p. 126

Potato polarity indicator for a battery. In: Graf, Safe and Simple, p.83

Potato test for electrical polarity. In: Brown, 666 Science Tricks & Expts., pp. 202-203

Testing the polarity of a variety of liquids using electrostatically charged rods. Sci Teach, Nov. '74, p. 53

Voltage indicator using LED's - indicates dc voltage polarity, reveals presence of ac voltage, and gives rough estimate of ac and dc voltage levels. Pop Elec, Apr. '74, p. 71

POLARIZATION (LIGHT)

See also POLARISCOPE; STEREOCHEMISTRY

Demonstrating fluid flow using polarized light, and photographing fluid motion. Sci Am, Feb. '80, pp. 162, 164, 167-168, 170, 172

Demonstration that a molecule with a spiral structure rotates the plane of plane-polarized light. Sci Teach, Oct. '82, pp. 51-52, and comment Jan. '83, p. 10

Interference with polarized light (Fresnel-Arago laws), using laser light. In: Kallard, Exploring, pp. 139-140

More about polarizers and how to use them. Sci Am, Jan. '78, pp. 132-136, 140

Polarized color, and making a Mylar polarizing color wheel. In: Wels, Science, pp. 14-16

Polarized light. In: Brown, 666 Science Tricks & Expts., pp. 301-302

Simple polarization demonstrations using laser light. In: Kallard, Exploring, pp. 88-99

6" polarizing spinner and stand can be used to show shapes in many colors. Project uses a projector, and many of the items are from purchased kits. In: Wels, Science, pp. 32-36

Studying polarized light with quarter-wave and half-wave plates of one's own making. Sci Am, Dec. '77, pp. 172-174, 177-180, 190

Using plastic and glass discs to make color wheels and polarizing spinners, which can then be rotated in front of a projector. In: Wels, Science, pp. 8-9

POLAROGRAPH AND POLAROGRAPHY

Polarographic analysis - behavior of cadmium(II), polarogram of a mixture of two ions, and anodic and cathodic polarograms. In: Skoog, Fundamentals, pp. 759-760 and other pages referred to in experimental procedure

POLLUTION

See also AIR - POLLUTION; RADIOACTIVE FALLOUT; WATER - POLLUTION

Picking up on litter - suggestions for studying littering. Sci Teach, Mar. '77, pp. 44-45

Pollution: a collection of simple classroom activities concerning pollution. In: Nelson, Science, pp. 361-378

POLYMERS AND POLYMERIZATION

See also PLASTICS

Bubbles blown from organic polymers survive for years. Sci Am, July '73, pp. 110-115, 122

Nylon rope trick, based on formation of a polymer from diacid chlorides and diamines. In: Chen, Entertaining, p. 74

POND SKATER (INSECT)
See WATER STRIDERS (INSECTS)

POTASSIUM
Determination of sodium, potassium, and calcium in mineral waters. In: Skoog, Fundamentals, p. 765 and chapter 25
Fire on water - pea-sized piece of potassium or sodium on water will produce hydrogen which ignites from the heat of reaction. In: Chen, Entertaining, p. 50

POTASSIUM CHLORATE
Small amount of a mixture of potassium chlorate and sulfur produces a loud bang when hit by a hammer. In: Chen, Entertaining, p. 66
Spontaneous combustion - red phosphorus and potassium chlorate. In: Chen, Entertaining, p. 48
Yellow phosphorus and potassium chlorate tablet used to produce an explosion. In: Chen, Entertaining, pp. 66-67

POTASSIUM COMPOUNDS
Analysis of weak acids by titration, including determination of potassium hydrogen phthalate in an impure sample and analysis of vinegar for its acid content. In: Skoog, Fundamentals, pp. 731-732
Arborescent crystallization of copper sulphate or potassium ferricyanide on a glass plate. In: Cherrier, Fascinating...Chemistry, p. 20
Changing "water" into "wine" into "cider" - a chemical color demonstration using potassium permanganate and oxygenated water. In: Cherrier, Fascinating...Chemistry, p. 80
Making "precious stones" of various shapes and colors by crystallization of, e.g., potassium alum, chrome alum, potassium ferricyanide and magnesium sulphate. In: Cherrier, Fascinating...Chemistry, pp. 24-25

POTASSIUM NITRATE
Fire writing and drawing, using potassium nitrate solution. In: Chen, Entertaining, p. 52

POTATOES
See also SWEET POTATOES

Cutting a potato with paper -- paper-wrapped knife blade will cut the potato, but won't cut the paper. In: Goldstein-Jackson, Experiments, pp. 82-83
How can we determine which is the positive pole of a battery? Potato used in this demonstration. In: Nelson, Science, p. 128
Potato polarity indicator for a battery. In: Graf, Safe and Simple, p. 83
Potato power station. In: Richards, Science Magic, pp. 56-57
Potato test for electrical polarity. In: Brown, 666 Science Tricks & Expts., pp. 202-203
Potatoes. In: McPhee, Gardening, pp. [14-15]

POTENTIAL ENERGY
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POTENTIOMETRY (CHEMISTRY)
See also, e.g., COULOMETRY (CHEMISTRY); GRAVIMETRIC ANALYSIS (CHEMISTRY); VOLUMETRIC ANALYSIS (CHEMISTRY); and other specific chemical analytical methods

Neutralization and potentiometric titration analysis of amines and amino acids in glacial acetic acid as solvent. In: Skoog, Fundamentals, pp. 263-266, 735-737, 756

POTENTIOMETRY (CHEMISTRY)
Potentiometric determination of the pH of water. In: Skoog, Fundamentals, pp. 753-754
Potentiometric titration of a carbonate-bicarbonate mixture. In: Skoog, Fundamentals, pp. 753-755
Potentiometric titration of a chloride-iodide mixture. In: Skoog, Fundamentals, pp. 411 and 753+ and other pages as referred to in experimental procedure
Potentiometric titration of a phosphate mixture. In: Skoog, Fundamentals, pp. 753 and 755
Potentiometric titration of a weak acid. In: Skoog, Fundamentals, pp. 753-754
Potentiometric titration of iron(II) with quadrivalent cerium. In: Skoog, Fundamentals, pp. 753, 756, chapter 17, and other pages as referred to in experimental procedure
Potentiometric titration of organic salts in glacial acetic acid. In: Skoog, Fundamentals, pp. 753, 755-756, and chapter 17
Potentiometric titrations - general instructions, and several specific experiments which have been indexed separately. In: Skoog, Fundamentals, pp. 753-756 and other pages as referred to in experimental procedure

POWDERS
See also BAKING POWDER; CRYSTALS AND CRYSTALLIZATION

Investigating the mixing of different powders - they seem to have lives of their own. Sci Am, Sept. '82, pp. 206, 208, 211-212, 216, 218

POWER (MECHANICS)
See also ELECTRIC POWER; FORCE AND ENERGY; MOTORS; POWER RESOURCES; WORK (MECHANICS)

Experiment measuring power (work per unit time), and discussion of and sample statistics regarding power. In: Gardner, Moving Right Along, pp. 125-126

POWER RESOURCES
See also the various headings beginning with ELECTRIC; FUEL; SOLAR ENERGY; VOLTAGE

Adjustable-current dc power supply circuit. Pop Elec, Sept. '74, pp.82-83
Adjustable regulated power supply - project of one semester or more for high school advanced electronics shop students. In: Giant Handbook, pp. 391-394
Budget power supply for solid-state projects. In: Friedman, 99 Practical, pp. 79-80
Build a preregulated power supply. Pop Elec, Nov. '75, pp. 58-60, and correction Feb. '76, p. 7
Build the little giant power supply - one IC makes blow-out-proof selectable voltage supply. Pop Elec, Feb. '73, pp. 62-64
Dual-polarity five-volt power supply. Pop Elec, May '82, p. 108
800-900 volt power supply for tube-type transceivers (100 watts). In: Carr, 104 Weekend, pp. 203-205
8-volt, 20-ampere unregulated (S-100 computer) dc power supply. In: Carr, 104 Weekend, pp. 216-220
Experimenter's power supply. In: Giant Handbook, pp. 380-382
Experimenter's power supply. In: Mendelson, 103 Simple, p. 78

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POWER RESOURCES (continued)

5-volt, 5-ampere regulated dc power supply. In: Carr, 104 Weekend, pp. 183-184

5-volt, 1-ampere regulated dc power supply for TTL projects. In: Carr, 104 Weekend, pp. 177-180

5-volt power supply. Pop Elec, May '76, p. 66

5-volt, 10-ampere regulated dc power supply. In: Carr, 104 Weekend, pp. 208-211

5-volt, 3-ampere regulated power supply for TTL and small computer projects. In: Carr, 104 Weekend, pp. 180-183

High-quality bench power supply. Pop Elec, Aug. '73, pp. 33-35

How to design and build power supplies. Pop Elec, Apr. '78, pp. 41-43, 48-49 and May '78, pp. 61-64, and correction July '78, p. 6

How to design your own power supplies. Pop Elec, June '75, pp. 36-39, and correction Aug. '75, p. 6, and addition Nov. '75, p. 6, and additional circuit Mar. '76, p. 6

Low-cost, easy-to-build power supply - 12V, 6 amp. Pop Elec, Dec. '74, p. 78

Low-cost general-purpose bench power supply can deliver between 5 and 16 volts at about 2 amperes. Pop Elec, Nov. '73, p. 26

Low-cost power supply for car tape players. In: Giant Handbook, pp. 375-376

Low-ripple preamplifier power supply. In: Friedman, 99 Practical, pp. 82-83

Low-voltage dc power supply. In: Giant Handbook, pp. 378, 380

Miniature dc-dc converter. Pop Elec, May '79, p. 93

±15-volt, 1-ampere regulated dc power supply. In: Carr, 104 Weekend, pp. 211-213

±12-volt dual-polarity, 1-ampere regulated power supply. In: Carr, 104 Weekend, pp. 205-208

±24-volt, 1-ampere regulated dc power supply. In: Carr, 104 Weekend, pp. 213-215

Portable power supply test panel will supply 110V AC, low-voltage AC (6V, 12V, 18V), and low-voltage DC (6V), and a built-in series tester. In: Giant Handbook, pp. 445-446

Potato power station. In: Richards, Science Magic, pp. 56-57

Power guard - boosts voltage and eliminates TV picture shrinkage during summer brownouts. Pop Elec, July '75, pp. 34-35

Power supplies for op amps. Pop Elec, Apr. '81, pp. 57-60, and correction June '81, p. 6

Power supplies: +5, +9, and +15 volt using IC voltage regulators. In: Fox, Unique Electronic, pp. 127-131

Power-supply overload protection. Pop Elec, Mar. '80, p. 74

Regulated 9-volt power supply. In: Friedman, 99 Practical, pp. 78-79

Regulated power supply with range of approximately 5 to 25 volts, allowing 3 amperes draw. In: Mendelson, 103 Simple, pp. 26-27

Regulated power supply with variable output. In: Giant Handbook, pp. 377-379

Simple precision power supply for electronics workbench. Pop Elec, June '79, pp. 69-70, 74-75

Solid-state power from old tube power transformers. In: Giant Handbook, pp. 387-391

13.6-volt, 5-ampere (CB and 2-meter) dc power supply. In: Carr, 104 Weekend, pp. 172-176

3000-volt, 1KW power supply for amateur radio linear amplifiers. In: Carr, 104 Weekend, pp. 198-203

Three-way experimenter's bench power supply. In: Carr, 104 Weekend, pp. 215-216

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Three-way power supply. Pop Elec, Jan. '74, pp. 62-66
12-volt dc, 1-ampere regulated power supply. In: Carr, 104 Weekend, pp. 191-194
12-volt dc unregulated 20-ampere power supply. In: Carr, 104 Weekend, pp. 183, 185-189
12-volt, 3-ampere dc regulated power supply. In: Carr, 104 Weekend, pp. 169-172
24-volt, 1-ampere regulated dc power supply; also modifiable for +15 and +12 volts. In: Carr, 104 Weekend, pp. 194-198
Variable-voltage regulated dc power supply. In: Carr, 104 Weekend, pp. 189-191
Very low voltage power supply. In: Mendelson, 103 Simple, p. 103
Voltage-regulated dc power supply. Pop Elec, Sept. '74, pp. 82-83
Zener-regulated power supply. In: Giant Handbook, pp. 383-387
Zero-to-30-volt experimenter's supply. Pop Elec, Feb. '75, pp. 70-71

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PRAYING MANTIS (INSECT)
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PREAMPLIFIERS
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PRECESSION
See also TOP

Delights of the "wobbler", a coin or cylinder that precesses as it spins. Sci Am, Oct. '82, pp. 184, 186, 188, 190, 192, 194

PRECIPITATION (CHEMISTRY)
Construction and use of a classroom Cottrell precipitator. Sci Teach, Dec. '73, p. 49
Precipitation reaction - magnesium sulfate and ammonia. In: Brown, 666 Science Tricks & Expts., p. 361

PRECOGNITION
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PRESSURE
See also AIR PRESSURE; BAROMETER; SUCTION; VAPOR PRESSURE; WATER PRESSURE

Bet you can't cut an ice block in two with a wire! -- pressure of the wire melts the ice; ice then refreezes. In: Cobb, Bet You Can't, pp. 92-93
Cutting a potato with paper -- paper-wrapped knife blade will cut the potato, but won't cut the paper. In: Goldstein-Jackson, Experiments, pp. 82-83
Demonstrating the strength of an eggshell. In: Goldstein-Jackson, Experiments, pp. 86-87
The difficult feat of crushing an egg in your hand. In: Herbert, Mr. Wizard's, p. 40
Le Chatelier's principle - pressure effects: demonstration with nitrogen dioxide. Sci Teach, Feb. '73, p. 57

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PRESSURE (continued)

Pressure and equilibrium: passing a fine wire through an ice cube. Sci Teach, Nov. '82, p. 54

Reflections on the rising bubbles in a bottle of beer. Sci Am, Dec. '81, pp. 172-174, 176, 186, and correction and addition Oct. '82, pp. 190, 192

Tough balloon - if a smooth surface is placed on a balloon it is quite difficult to break the balloon by pressing down on the surface because the pressure is small. In: Brown, 666 Science Tricks & Expts., p. 396

PRISMS

See also RAINBOW; REFRACTION; SPECTRUM (LIGHT) AND SPECTRUM ANALYSIS

Are all kinds of light rays the same? Demonstration uses a prism to produce a spectrum of colors from sunlight. In: Nelson, Science, p. 81

Cabinet of mirrors - three-sided prism with reflecting surfaces facing inward. In: Lanners, Secrets, pp. 134, 136

A simple [water] prism. In: Lanners, Secrets, pp. 114-116

PROBABILITIES

See also STATISTICS

Random walks and gambling. In: Gardner, Mathematical Circus, pp. 66-74

Random walks on the plane and in space. In: Gardner, Mathematical Circus, pp. 75-86

PROGRAMMING (ELECTRONIC COMPUTERS)

See also COMPUTERS

Binary, octal and hexadecimal numbers - how to understand and apply the three basic numbering systems in computer programming. Pop Elec, Mar. '81, pp. 63-66

Low cost EPROM programmer. Pop Elec, Feb. '78, pp. 41-45 and Mar. '78, pp. 55-58

PROJECTORS AND PROJECTION

Build the 35mm slide syncer -- low-cost programmer for audio-visual presentations. Pop Elec, Nov. '76, pp. 74-76, and correction July '77, p.6

Camera and projector. In: Clarke, Encyclopedia of How It Works, pp. 36-51

Homemade microprojector, using a slide projector and a tilting microscope. Sci Teach, Apr. '82, p. 55

Low-budget microprojector using an overhead projector. Sci Teach, Sept. '79, pp. 45-46

Making an overhead projector using a Fresnel lens. In: Wels, Science, pp. 58-59

Multi-purpose projector for transparencies, microprojection, animated projection, etc. In: Cherrier, Fascinating...Physics, pp. 60-62

6" polarizing spinner and stand can be used to show shapes in many colors. Project uses a projector, and many of the items are from purchased kits. In: Wels, Science, pp. 32-36

Slide projector - how it works. In: Papallo, What Makes It Work, pp. 108-109

Slide projector programmer - showing slides with synchronized prerecorded commentary. In: Friedman, 99 Practical, p. 73

Some ideas on using a 35mm visual effects projector. In: Wels, Science, pp. 20-23

PROJECTORS AND PROJECTION (continued)
Using plastic and glass discs to make color wheels and polarizing spinners, which can then be rotated in front of a projector. In: Wels, Science, pp. 8-9
Video microprojection in your classroom. Sci Teach, Dec. '79, p. 33

PROPELLERS
See also PADDLE WHEELS

How does an airplane propeller work? Construction of a simple propeller. In: Nelson, Science, p. 192

PROPULSION
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PROTEINS
Kjeldahl analysis for organic amine nitrogen - procedure suitable for analysis of protein. In: Skoog, Fundamentals, pp. 244-246 and 734-735
Testing foods for proteins. In: Baldini, Student Science Activities, p.117

PROTOZOA
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Mutualism - a laboratory exercise on termite protozoa and cellulose digestion. Sci Teach, Apr. '73, pp. 42-44

PSYCHROMETER
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PUBLIC ADDRESS SYSTEM
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PULLEYS
Constructing a scale using an elastic band and a cardboard tube, and experimenting with a simple pulley. In: Tuey, How to Be, pp. 44-47
Pulleys. In: Brown, 666 Science Tricks & Expts., pp. 392-393
Spool makes a convenient roller for a homemade pulley. In: Herbert, Mr. Wizard's, p. 85

PULSE
Making your pulse visible with a matchstick. In: Goldstein-Jackson, Experiments, pp. 78-79
See the pulse beat. In: Brown, 666 Science Tricks & Expts., p. 115

PULSE GENERATORS
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PUMPING MACHINERY
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Construction and operation of a simple lift pump. In: Richards, Science Magic, p. 20
Digital-logic automatic pump control circuit. Pop Elec, June '78, pp. 95-96

PUMPKIN
Pumpkins. In: McPhee, Gardening, pp. [8-9]

PUMPS, VACUUM
See VACUUM PUMPS

PUTREFACTION

PUTREFACTION
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PUZZLES
See also MATHEMATICAL RECREATIONS

Card shuffling - discussion and puzzles. In: Gardner, Mathematical Carnival, pp. 123-128
Cooks and quibble-cooks: mathematical puzzles solved correctly and incorrectly. In: Gardner, Mathematical Carnival, pp. 226-239
Glass-of-water puzzle - effect of placing a finger in one of two balanced glasses of water. In: Herbert, Mr. Wizard's, p. 81
Paper-cup puzzle involving measuring out a quantity of water. In: Herbert, Mr. Wizard's, p. 73
Penny puzzles - geometric problems. In: Gardner, Mathematical Carnival, pp. 12-26
Puzzles about arithmetic. In: Gardner, Aha!, pp. 61-85
Puzzles about arrangements. In: Gardner, Aha!, pp. 3-27
Puzzles about letters, words, and sentences, including some numerical puzzles. In: Gardner, Aha!, pp. 139-167
Puzzles about reasoning. In: Gardner, Aha!, pp. 89-111
Puzzles about routines. In: Gardner, Aha!, pp. 115-135
Puzzles about shapes. In: Gardner, Aha!, pp. 31-57
Puzzles with dominoes. In: Gardner, Mathematical Circus, pp. 137-151
Red-faced cube, and other mathematical (mainly geometrical) puzzles. In: Gardner, Mathematical Carnival, pp. 103-122
Rising hourglass and other physics puzzles. In: Gardner, Mathematical Carnival, pp. 173-193
Tube puzzle - what was the original shape of cardboard which was made into a spiral paper tube? In: Herbert, Mr. Wizard's, p. 74
Various mathematical puzzles, including some topological problems and three Möbius strip puzzles. In: Cobb, Bet You Can't, pp. 67-82

PYRAMIDS
Investigating whether objects are affected by being placed under a pyramid. In: Wels, Science, pp. 85-86

PYRO- AND PIEZOELECTRICITY
See also OSCILLATORS, CRYSTAL

Experimenting with piezoelectric devices. Pop Elec, July '82, pp. 82-84 and Aug. '82, pp. 80, 82-83
Piezoelectric speaker siren. Computers & Electronics, Dec. '83, pp. 89-92

PYROTECHNICS
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QUADRANT
Build-it-yourself astronomy: making and using the cross staff and the quadrant. Sci Teach, Mar. '83, pp. 48-51
Measuring with a quadrant. Sci Teach, Mar. '78, pp. 34-35

QUALITATIVE ANALYSIS (CHEMISTRY)
See CHEMISTRY, ANALYTIC - QUALITATIVE

QUANTITATIVE ANALYSIS (CHEMISTRY)
See CHEMISTRY, ANALYTIC - QUANTITATIVE

RADAR
Detection of military and airport radar stations; antenna made of a paper clip. Sci Am, Jan. '73, pp. 119-120, 128
How radar works. In: How Things Work, pp. 56-59
The optical Doppler radar. In: Kallard, Exploring, pp. 174-175
Radar. In: Clarke, Encyclopedia of How It Works, pp. 176-179
Radar - how it works. In: Papallo, What Makes It Work, p. 114

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See also, e.g., GEIGER-MÜLLER COUNTERS; HEAT - RADIATION AND ABSORPTION; INFRARED RAYS; LIGHT; MICROWAVES; RADIO WAVES; RADIOACTIVE FALLOUT; SOLAR RADIATION; SOUND; SPECTRUM (LIGHT) AND SPECTRUM ANALYSIS; ULTRAVIOLET RAYS; X-RAYS

Build an electronic personal radiation monitor. Pop Elec, Jan. '80, pp. 39-43, 46, and corrections Mar. '80, p. 6
Radiation detector made out of aluminum foil and a tin can. Sci Am, Sept. '79, pp. 234, 236, 238, 243-244, 246, 250

RADIO
See also, e.g., MODULATION (ELECTRONICS); OSCILLATORS, ELECTRIC; RADAR; SOUND - RECORDING AND REPRODUCING

Hearing-aid-to-radio converter. In: Mendelson, 103 Simple, p. 46
Radio. In: Clarke, Encyclopedia of How It Works, pp. 179-182

RADIO - ANTENNAS
See also ANTENNAS (ELECTRONICS)

Aerial (antenna). In: Clarke, Encyclopedia of How It Works, pp. 8-10
Antenna tuner for SWL's. Pop Elec, Jan. '73, p. 71
Antennas for CB'ers and hams. Pop Elec, Sept. '73, pp. 95-98 and Oct. '73, pp. 51-55
Broadcast band loop antenna for DX'ing. Pop Elec, Mar. '76, pp. 51-53
Extended CB mobile whip antenna. In: Friedman, 99 Practical, pp. 41-42
Flag-pole ham antenna. Pop Elec, Jan. '74, pp. 98-99
Indoor 20-meter ham antenna. Pop Elec, Oct. '74, p. 52
Low-cost loop antenna extends AM radio reception. Pop Elec, July '78, p. 59
Multi-band antenna. In: Carr, 104 Weekend, pp. 132-133
Portable CB antenna. In: Friedman, 99 Practical, pp. 40-41
Rotatable antenna. In: Carr, 104 Weekend, pp. 128-130
Short 80- through 10-meter band ham antenna. Pop Elec, Apr. '73, pp. 56-57
Signal source for antenna measurements. In: Carr, 104 Weekend, pp. 115-117
Simple vertical antenna. In: Carr, 104 Weekend, pp. 130-131
Universal antenna coupler. In: Carr, 104 Weekend, pp. 133-136

RADIO - APPARATUS AND SUPPLIES

RADIO - APPARATUS AND SUPPLIES

Auto voltage adapter for transistor radios. In: Friedman, 99 Practical, pp. 26-27

Electronic commercial killer for a clock radio. Pop Elec, June '81, p. 67

Rf power meter for amateur radio operators and CB. In: Carr, 104 Weekend, pp. 111-115

Simple field-strength meter for evaluating antennas and transmitters. Pop Elec, June '73, p. 94

RADIO - APPARATUS AND SUPPLIES - TESTING

1000 Hz blitzit - a square wave for troubleshooting dead radios. In: Carr, 104 Weekend, pp. 237-238

Radio-TV signal tracer. In: Mendelson, 103 Simple, pp. 93-94

RADIO - INTERFERENCE

Build a low-cost squelch circuit - useful addition for receivers without built-in squelch. Pop Elec, Feb. '73, pp. 110-111 and Jan. '75, p. 71

FM interstation quieter. In: Mendelson, 103 Simple, p. 21

Noise limiter, using two diodes. In: Mendelson, 103 Simple, p. 53

TNS mobile noise killer and squelch will greatly reduce ignition noise from auto operation. In: Mendelson, 103 Simple, pp. 12-13

RADIO - RECEIVERS AND RECEPTION

AM broadcast band receiver circuit. Pop Elec, May '77, pp. 78, 84-85

AM broadcast tuner will convert a phonograph or audio amplifier into a household radio. In: Mendelson, 103 Simple, p. 23

AM radio booster circuit to strengthen signals. In: Mendelson, 103 Simple, p. 70

Amplified crystal radio. In: Friedman, 99 Practical, pp. 85-86

BFO for transistor radios allows cw and ssb radio reception. In: Friedman, 99 Practical, p. 87

Broadcast band booster, using a transistor. In: Friedman, 99 Practical, pp. 35-37

Build a direct-conversion communication receiver. Pop Elec, Nov. '74, pp. 48-51

Build a low-cost squelch circuit - useful addition for receivers without built-in squelch. Pop Elec, Feb. '73, pp. 110-111 and Jan. '75, p. 71

CB channel locator. In: Mendelson, 103 Simple, p. 17

CB modulation meter to measure percentage modulation of a CB transceiver. In: Friedman, 99 Practical, pp. 38-39

CB radio receiver tuning adapter -- crystal-controlled CB receiver can be converted to full 40-channel coverage. In: Friedman, 99 Practical, pp. 51-52

Clorox powered AM radio. In: Mendelson, 103 Simple, p. 38

"DX Special" AM receiver. In: Mendelson, 103 Simple, pp. 65-66

Diode radio receiver. In: Traister, First Book, pp. 21-24

Diode-transistor radio. In: Traister, First Book, pp. 28-30

Direct-coupled radio. In: Friedman, 99 Practical, pp. 84-85

Emergency broadcast system monitor monitors output of broadcast receiver and sounds necessary warning. Pop Elec, Dec. '80, pp. 62, 64-66

FM interstation quieter. In: Mendelson, 103 Simple, p. 21

FM "Mini-ceiver" -- a one-transistor, FM broadcast receiver. In: Mendelson, 103 Simple, p. 115

Ham aligner - basically a crystal marker oscillator, useful in setting dial on receiver or transmitter. In: Carr, 104 Weekend, pp. 230-232

High-performance radio receiver. In: Giant Handbook, pp. 19-25

How a stereo radio works, including information on transmission from the studio. In: How Things Work, pp. 48-51

RADIO - RECEIVERS AND RECEPTION (continued)

How to build "free power" radios. Pop Elec, Oct. '73, pp. 62-64

Legal in-flight airline pilot-to-control receiver. Pop Elec, May '77, pp. 61-63, and comment Sept. '77, p. 6

Light-powered AM radio using a small solar cell. In: Traister, First Book, pp. 56-60

Medium wave/long wave radio receiver - circuit, how to build, how it works, and parts list. In: Duncan, Adventures, pp. 60-63

Mobile shortwave converter enables tuning across standard auto AM radio dial to hear radio stations around the world. In: Mendelson, 103 Simple, pp. 63-64

Most powerful crystal set? In: Mendelson, 103 Simple, p. 107

"No-power" receiver. In: Mendelson, 103 Simple, p. 59

Noise limiter, using two diodes. In: Mendelson, 103 Simple, p. 53

Op-amp AM radio receiver. Pop Elec, Dec. '80, p. 89

Radio preamplifier. In: Traister, First Book, pp. 34-36

Receiver with push-pull amplification and detection. In: Mendelson, 103 Simple, p. 68

Regenerative detector for 6 meters -- can extract audio-signal information from amplitude-modulated rf input signal as small as 0.5 microvolt. In: Mendelson, 103 Simple, p. 22

Ship-to-shore SW converter allows tuning of 2- to 3-MHz marine band on car or home radio. In: Mendelson, 103 Simple, pp. 50-51

Sideband scrambler - can be used in sideband transmitter-receiver or telephone speech scrambler. In: Friedman, 99 Practical, p. 60

Simple crystal radio. In: Giant Handbook, pp. 24-25

"Strap iron" radio that can be built for only a few dollars. In: Giant Handbook, pp. 13-18

Supersonic receiver; radio receiver or audio amplifier can serve as transmitter. In: Mendelson, 103 Simple, p. 97

TNS mobile noise killer and squelch will greatly reduce ignition noise from auto operation. In: Mendelson, 103 Simple, pp. 12-13

Transistor radio - how to build one easily and inexpensively. In: Giant Handbook, pp. 10-13

Two single-IC AM receiver projects. Pop Elec, June '74, pp. 58-63

Two-transistor receiver. In: Mendelson, 103 Simple, p. 41

VLF "whistler" receiver allows monitoring of natural sounds. In: Mendelson, 103 Simple, pp. 90-91

WWV converter for AM radio -- provides correct time, perfect 440-Hz and 660-Hz pitch and ionospheric reports. In: Mendelson, 103 Simple, pp. 99-100

World's smallest receiver? In: Mendelson, 103 Simple, p. 98

RADIO - TRANSMITTERS AND TRANSMISSION

AM modulation monitor for a-m ham transmitter. In: Friedman, 99 Practical, pp. 39-40

Broadcast band CW transmitter, for use as a code practice oscillator or for short distance communications. In: Mendelson, 103 Simple, pp.123-124

CB modulation meter to measure percentage modulation of a CB transceiver. In: Friedman, 99 Practical, pp. 38-39

CB scope booster - output from CB transmitter can be viewed on oscilloscope. In: Friedman, 99 Practical, pp. 107-108

CB transmission line monitor. In: Friedman, 99 Practical, pp. 37-38

CW monitor allows cheap, easy way of listening to your own CW transmission. In: Mendelson, 103 Simple, p. 86

Circuit using two transistors to develop 1 1/2 watts on the 80-meter ham band. In: Mendelson, 103 Simple, p. 25

RADIO - TRANSMITTERS AND TRANSMISSION

RADIO - TRANSMITTERS AND TRANSMISSION (continued)

Code transmitter - allows sending code signals to a standard AM broadcast radio a short distance away. In: Traister, First Book, pp. 49-51

Electronic keyer, designed to work with a semiautomatic key. In: Friedman, 99 Practical, pp. 52-53

15-meter flea-power transmitter. In: Friedman, 99 Practical, pp. 117-118

15-meter "flea watter" transmitter. In: Mendelson, 103 Simple, p. 113

5-watt carrier-current AM transmitter. Pop Elec, June '73, pp. 34-35

400-microwatt broadcast transmitter. In: Mendelson, 103 Simple, pp. 84-85

Ham aligner - basically a crystal marker oscillator, useful in setting dial on receiver or transmitter. In: Carr, 104 Weekend, pp. 230-232

How a stereo radio works, including information on transmission from the studio. In: How Things Work, pp. 48-51

Low-power broadcast band transmitter - a project for beginners. In: Giant Handbook, pp. 7-10

Multipurpose low power transmitter using 27 MHz overtone crystals. In: Friedman, 99 Practical, pp. 116-117

Radio pager producing low output CB signal, suitable for paging inside a building. In: Friedman, 99 Practical, pp. 114-115

Sideband scrambler -- can be used in sideband transmitter-receiver or telephone speech scrambler. In: Friedman, 99 Practical, p. 60

Sun powered 40-meter transmitter. In: Mendelson, 103 Simple, p. 69

Supersensitive field-strength meter gets useful meter indications from weak transmitters and CB walkie-talkies -- frequency range 3 to 30 MHz. In: Friedman, 99 Practical, pp. 42-43

Supersonic receiver; radio receiver or audio amplifier can serve as transmitter. In: Mendelson, 103 Simple, p. 97

10-, 15-, 20-meter DX transmitter. In: Mendelson, 103 Simple, pp. 60-61

Transistor transmitter. In: Giant Handbook, pp. 18-19

Two-meter transmitter hunt beacon. In: Mendelson, 103 Simple, pp. 10-12

World's smallest transmitter? -- low-power, designed for operation on a relatively wide range of frequencies. In: Mendelson, 103 Simple, p. 76

RADIO, SHORT WAVE

See also the various subdivisions under RADIO for additional relevant items

RADIO, SHORT WAVE - RECEIVERS AND RECEPTION

Antenna tuner for SWL's (short wave listeners). Pop Elec, Jan. '73, p. 71

Broadcast-band notch filter. Computers & Electronics, Feb. '83, pp. 68-69

Build a deluxe frequency standard - useful for shortwave radio tuning. Pop Elec, Jan. '74, pp. 80-82, and additional comment June '74, p. 9

Build an ocean-spanning crystal receiver. Pop Elec, July '81, pp. 69-71

Build the "super marker", allowing precise tuning of shortwave receivers. Pop Elec, Mar. '79, pp. 74-75

Experiments with a shortwave receiver. Pop Elec, Dec. '73, pp. 31-33

Frequency spotter for finding weak, short-wave signals. In: Friedman, 99 Practical, pp. 49-50

Hf shortwave preselector. In: Carr, 104 Weekend, pp. 76-79

Mobile shortwave converter enables tuning across standard auto AM radio dial to hear radio stations around the world. In: Mendelson, 103 Simple, pp. 63-64

100-KHz frequency standard to aid in short-wave frequency determination. In: Friedman, 99 Practical, pp. 48-49

RADIO, SHORT WAVE - RECEIVERS AND RECEPTION (continued)

Preamplifier for 6-, 10-, or 15-meter amateur-band receiver. In: Mendelson, 103 Simple, pp. 80-81

Radioteletype reader for shortwave receivers. Pop Elec, Nov. '79, pp. 39-40, 42, 46-48, 50, and Dec. '79, pp. 75-81

S-9er for SWL's (super sensitive short-wave preselector). In: Friedman, 99 Practical, pp. 46-47

Ship-to-shore SW converter allows tuning of 2- and 3-MHz marine band on car or home radio. In: Mendelson, 103 Simple, pp. 50-51

Shortwave converter for any AM radio. Pop Elec, Jan. '82, pp. 65+

Weather satellite's shortwave radio pictures picked up in the home. Sci Am, Jan. '74, pp. 114-120, 130

RADIO ASTRONOMY

Introduction to radio astronomy, plus instructions for a simple telescope system. Pop Elec, Jan. '76, pp. 41-45, and addition May '76, p. 6

RADIO FILTER

See ELECTRIC FILTERS

RADIO WAVES

See also MICROWAVES

Holograms with sound and radio waves; sound and radio waves recorded on film by a precooling process. In: Light and Its Uses, pp. 57-61 (also in "Amateur Scientist" column, Sci Am, Nov. '72)

Simple apparatus to demonstrate radio wave transmission and reception - uses toy train transformer, bell wire, rulers and earphones. In: Simon, How to Be a Space Scientist, pp. 42-43

RADIOACTIVE FALLOUT

Kearny, The KFM: A Homemade Yet Accurate and Dependable Fallout Meter

RADIOMETER

Measure the sun's energy with a solar radiometer. Pop Elec, Dec. '76, pp. 45-47 and addition May '78, p. 6

Studies with the radiometer; to measure the intensity of solar radiation using a vane-type radiometer. In: Norton, Solar Energy, pp. 34-36

RAILROADS - MODELS

Control your model railroad with audio tape. Pop Elec, Nov. '78, pp. 83-85

RAILROADS - MODELS - ELECTRIC EQUIPMENT

Flashing railroad crossing lights for an HO railroad. In: Malcolm, How to Build Electronic Projects, pp. 117-119

IC speed controller for HO model railroads. Pop Elec, Jan. '75, pp. 58-59, and addition May '75, p. 7

LED traffic light for model railroad and car layouts. Pop Elec, Dec. '79, pp. 51, 54-56

Model-railroad crossing light. Pop Elec, May '81, pp. 96+, and comment Jan. '82, p. 81, and simplified version, Computers & Electronics, Nov. '83, pp. 96, 98

Model railroad sound synthesizer. Pop Elec, Dec. '77, pp. 80-83

Model train steam whistle circuit. Pop Elec, Feb. '78, pp. 80-81

Speed control circuit for slot cars and HO model trains. Pop Elec, June '75, pp. 64-65

Steam engine and whistle sound synthesizer. Pop Elec, June '81, p. 96

Voice-controlled train. In: Giant Handbook, pp. 319-321

RAIN AND RAINFALL

RAIN AND RAINFALL
See also METEOROLOGY

Clothespin alarms - set-up can be used to make a simple fire alarm or rain alarm. In: Herbert, Mr. Wizard's, p. 54
Double-boiler rain - demonstration of why it rains. In: Herbert, Mr. Wizard's, p. 63
Electronic device to determine when it begins to rain. Pop Elec, June '73, p. 94
How can we measure rainfall? Collecting rain and measuring it in a calibrated jar. In: Nelson, Science, p. 183
The sampling of rain - determining the size and size distribution of raindrops. In: Schaefer, A Field Guide, pp. 309-311
Weather indicator - cardboard painted with cobalt chloride solution is a different color when wet and dry. In: Cherrier, Fascinating... Chemistry, p. 51
Where does rain come from? Demonstration using steam from a teakettle and a pan of icewater. In: Nelson, Science. p. 182
Why does it rain? A number of demonstrations of the process of condensation. In: Amery, KnowHow...Experiments, p. 29

RAINBOW
See also REFRACTION; SPECTRUM (LIGHT) AND SPECTRUM ANALYSIS

How to create and observe a dozen rainbows in a single drop of water. Sci Am, July '77, pp. 138-142, 144, 154, and additional comment on orders of rainbows Oct. '78, pp. 185-187
Making rainbows from sunlight. In: Richards, Science Magic, pp. 30-31
Mysteries of rainbows, notably their rare supernumerary arcs. Sci Am, June '80, pp. 174-176, 178, 180, 183-184, 186
Simulating rainbows. Sci Teach, Feb. '75, pp. 57-59
Super rainbow bubbles. In: Penrose, Dr. Zed's Dazzling, pp. 4-5
Ways of producing a rainbow. In: Cherrier, Fascinating...Physics, p. 75
What makes a rainbow? How to make a rainbow and why rainbows are formed. In: Amery, KnowHow...Experiments, p. 18

RANDOM NUMBERS
See NUMBERS, RANDOM

RANDOM WALK
See PROBABILITIES

RANGE-FINDING
"Sliding lens" type rangefinder, using laser light. In: Kallard, Exploring, pp. 69-70
Unit for sound detection and ranging. In: Giant Handbook, pp. 298-305

RATS
Raising rats with a high IQ. In: Stein, Science Book, pp. 30-31

REACTION TIME
Electronic reaction timer. In: Duncan, Adventures, pp. 56-59

RECORD PLAYER
See PHONOGRAPH

RECTANGLE
Magic rectangle - arcs from corners will form a perfect circle. In: Shalit, Science, pp. 29-30

RECTIFIERS (ELECTRICITY)
See ELECTRIC CURRENT RECTIFIERS

REDUCTION, CHEMICAL
See also OXIDATION; OXIDATION-REDUCTION REACTION

Photochemical reduction of iron(III) by oxalic acid. In: Chen, Entertaining, p. 57
Photochemical reduction of thionin. In: Chen, Entertaining, pp. 57-58

REFLECTION (OPTICS)
See also CONCAVE SURFACES; CONVEX SURFACES; MIRRORS; REFLECTORS, PARABOLIC; REFRACTION

Approximating the radius of curvature of small concave mirrors using laser light. In: Kallard, Exploring, pp. 44-45
Candle burning in water - illusion involving reflection. In: Brown, 666 Science Tricks & Expts., p. 82
Caustics: mathematical curves generated by light shined through rippled plastic - formed when light reaches a surface by refraction or reflection. Sci Am, Sept. '83, pp. 190-191, 195-197, 199-202
Demonstrating the penetration of laser light beyond a totally reflecting interface. In: Kallard, Exploring, pp. 65-66
Demonstrations involving light reflection. In: Brown, 666 Science Tricks & Expts., pp. 291-292, 295-298, 302, 308-312
Fingerprint observation by frustrated total reflection, using laser light. In: Kallard, Exploring, pp. 64-65
Laser exercises using a lazy susan optics table: reflectance and transmittance, exercises with mirrors, exercises involving refraction, internal reflection, prisms, semicircular bodies and lenses. In: Kallard, Exploring, pp. 25-37
Light tricks and water tricks involving reflection and refraction. In: Amery, KnowHow...Experiments, pp. 16-17
The luminous fountain, using laser light. In: Kallard, Exploring, p. 64
Magic mirror - two mirrors at right angles do not reverse a written message - double reflection. In: Shalit, Science, pp. 93-94
Metallized cardboard segments for big parabolic reflectors. Sci Am, Dec. '73, pp. 127-128, 148 and corrections Nov. '74, p. 128
Mirror images without mirrors. In: Lanners, Secrets, p. 134
Reflection trick known as Pepper's Ghost. In: Richards, Science Magic, p. 37
Reflective materials. In: Clarke, Encyclopedia of How It Works, p. 187
Studying multiple images using two sheets of glass or plexiglass set against a dark background. Sci Teach, Feb. '73, pp. 58-59

REFLECTORS, PARABOLIC
Metallized cardboard segments for big parabolic reflectors. Sci Am, Dec. '73, pp. 127-128, 148, and corrections Nov. '74, p. 128

REFLEXES
Bet you can't catch a dollar bill - demonstration of the relative slowness of reflex action. In: Cobb, Bet You Can't, p. 112
Don't blink - difficult not to blink when puff of air is directed at top of the nose. In: Brown, 666 Science Tricks & Expts., p. 136

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REFRACTION

See also LENSES; LIGHT - SCATTERING; PRISMS; RAINBOW; REFLECTION (OPTICS); REFRACTION, DOUBLE; REFRACTIVE INDEX; REFRACTOMETER AND REFRACTOMETRY

Are all kinds of light rays the same? Demonstration uses a prism to produce a spectrum of colors from sunlight. In: Nelson, Science, p. 81

Bet you can't see a penny through a glass of water - demonstration involving refraction of light rays. In: Cobb, Bet You Can't, pp. 94-95

Caustics: mathematical curves generated by light shined through rippled plastic - formed when light reaches a surface by refraction or reflection. Sci Am, Sept. '83, pp. 190-191, 195-197, 199-202

Demonstrations involving light refraction. In: Brown, 666 Science Tricks & Expts., pp. 293-294, 297, 302, 308, 312-313

Does water have magnifying and refractive qualities? Demonstration involves observation of the appearance of a spoon in a tumbler of water. In: Nelson, Science, p. 85

How to create and observe a dozen rainbows in a single drop of water. Sci Am, July '77, pp. 138-142, 144, 154, and additional comment on orders of rainbows Oct. '78, pp. 185-187

Laser exercises using a lazy susan optics table: reflectance and transmittance, exercises with mirrors, exercises involving refraction, internal reflection, prisms, semicircular bodies and lenses. In: Kallard, Exploring, pp. 25-37

Light tricks and water tricks involving reflection and refraction. In: Amery, KnowHow...Experiments, pp. 16-17

Magic based on refractive index - a disappearing beaker and a glass rod changed into a beaker. In: Chen, Entertaining, pp. 72-74

Mysteries of rainbows, notably their rare supernumerary arcs. Sci Am, June '80, pp. 174-176, 178, 180, 183-184, 186

Paths of light. In: Cherrier, Fascinating...Physics, pp. 64-65

Refractive index of liquids: inexpensive way to illustrate the laws of refraction and to determine the refractive index of glass and other substances. Sci Teach, Nov. '82, p. 54

Trick of refraction makes it appear that glass under water can be cut by scissors. In: Shalit, Science, pp. 94-95

Turning an arrow around without touching it by looking at it through a glass of water. In: Goldstein-Jackson, Experiments, pp. 152-153

"Vanishing" solution - light refraction demonstration. Sci Teach, Sept. '80, p. 44

Ways of producing a rainbow. In: Cherrier, Fascinating...Physics, p. 75

What makes a rainbow? How to make a rainbow and why rainbows are formed. In: Amery, KnowHow...Experiments, p. 18

Writing inversion trick using glass rod or glass of water. In: Shalit, Science, pp. 88-90

REFRACTION, DOUBLE

Polarized color, and making a Mylar polarizing color wheel. In: Wels, Science, pp. 14-16

6" polarizing spinner and stand can be used to show shapes in many colors. Project uses a projector, and many of the items are from purchased kits. In: Wels, Science, pp. 32-36

REFRACTIVE INDEX

Direct shadow demonstration (shadowgraphy) - simple method, using laser light, by which small changes in the refractive index of air can be made visible. In: Kallard, Exploring, pp. 61-62

Gradient-index (GRIN) lens for which the index of refraction varies internally. Sci Am, July '82, pp. 151-154

REFRACTIVE INDEX (continued)
Magic based on refractive index - a disappearing beaker and a glass rod changed into a beaker. In: Chen, Entertaining, pp. 72-74
Recording and measuring refractive index gradients using laser light. In: Kallard, Exploring, pp. 59-60
Refractive index measurements using laser light. In: Kallard, Exploring, pp. 54-56
Refractive index of liquids: inexpensive way to illustrate the laws of refraction and to determine the refractive index of glass and other substances. Sci Teach, Nov. '82, p. 54
Using a Michelson-type interferometer, using laser light, to measure the index of refraction of a gas. In: Kallard, Exploring, pp. 140-143

REFRACTOMETER AND REFRACTOMETRY
Diffraction refractometer, using laser light. In: Kallard, Exploring, pp. 203-204
Making a refractometer for the identification of liquids. Sci Am, May '75, pp. 109-115, 122

REFRIGERATION AND REFRIGERATING MACHINERY
The diffusion cold chamber - method of construction and experimentation. In: Schaefer, A Field Guide, pp. 285-287
The mixing cold chamber, made from a food freezer chest. Clouds can be formed and experimented on with this apparatus. In: Schaefer, A Field Guide, pp. 280-285
Soap bubbles for atmospheric studies -- local air flow, turbulence, convection, bubbles experimented with in a cold chamber, etc. In: Schaefer, A Field Guide, pp. 290-293

REFUSE AND REFUSE DISPOSAL
Picking up on litter -- suggestions for studying littering. Sci Teach, Mar. '77, pp. 44-45

REGULATORS (VOLTAGE)
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RELAYS, ELECTRIC
See ELECTRIC RELAYS

RELAYS, PHOTOELECTRIC
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REMOTE CONTROL
See also PHOTOELECTRIC CELLS

Low-cost remote control of appliances and lights. Pop Elec, May '75, pp. 46-47
Single-channel infrared remote-control system. Pop Elec, June '82, pp. 84, 86-88

REMOTE SENSING
Remote sensing, including description of assembly of some circuits. Pop Elec, July '81, pp. 75-78 and Aug. '81, pp. 76-80

REPTILES

REPTILES
See also SNAKES

Some facts about 24 prehistoric reptiles and mammals, mainly dinosaurs. In: Wels, Science, pp. 67-69

RESISTANCE (ELECTRICITY)
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RESISTORS, ELECTRIC
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RESONANCE
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The howling tube. In: Cherrier, Fascinating...Physics, p. 83
Sympathetic vibrations, using drinking glasses. In: Brown, 666 Science Tricks & Expts., pp. 93-94
What makes you sound so good when you sing in the shower? - experimenting with the harmonics of the shower stall. Sci Am, May '82, pp. 122, 124, 127-130

RESPIRATION
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Holding one's breath is difficult; partial physiological reason given. In: Brown, 666 Science Tricks & Expts., pp. 126-127
Measuring lung capacity - two spirometers. In: Baldini, Student Science Activities, pp. 125-127
Testing exhaled air. In: Baldini, Student Science Activities, p. 128
Testing for carbon dioxide in the air from a burning candle, and from the lungs. In: Simon, Projects, pp. 53-55

RHEOSTATS, ELECTRIC
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RIBBED PINE BORER
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RIKER BOX
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RIPENING OF FRUIT
See FRUIT - RIPENING

ROBOTS
Cummings, Make Your Own Robots -- includes electronics project for robot that maneuvres under its own power
Flashing robot with simple electrical circuit. In: Amery, KnowHow... Magnets, pp. 36-39
Loofbourrow, How to Build a Computer-Controlled Robot

ROCK CANDY
See CONFECTIONERY

ROCK SALT
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ROCKETS (AERONAUTICS)
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Rocket - how it works. In: Papallo, What Makes It Work, p. 141

ROCKETS (AERONAUTICS) - FUEL
Testing for water impurity in alcohol using anhydrous copper sulfate: demonstration related to the importance of the purity of rocket fuels. In: Simon, How to Be a Space Scientist, pp. 16-17

ROCKETS (AERONAUTICS) - LAUNCHING
How to escape from earth: using marbles and cardboard bent into a curve to demonstrate gravitational pull and to simulate spacecraft launch. In: Simon, How to Be a Space Scientist, pp. 19-20
How to make a rocket launching pad. In: Baldini, Student Science Activities, pp. 70-73
Measuring rocket power (thrust): experiment with a kitchen scale, a plastic bottle and cork, vinegar and bicarbonate of soda. In: Simon, How to Be a Space Scientist, pp. 10-11
Programmable countdown timer, one use of which is in automatic rocket launching. Pop Elec, Nov. '80, pp. 120-121
Rocket data test sheet; launching the carbon dioxide rocket; recording launch data. In: Baldini, Student Science Activities, pp. 75-78
Rocket launcher switch box. In: Giant Handbook, pp. 163-164, 174
Vinegar rocket launcher, based on build-up of carbon dioxide pressure. In: Herbert, Mr. Wizard's, p. 28

ROCKETS (AERONAUTICS) - MODELS
How to make a carbon dioxide rocket using carbon dioxide cartridges. In: Baldini, Student Science Activities, pp. 74-75
Launching a balloon "rocket" to learn what makes a rocket move. In: Greenleaf, Experiments in Space Science, p. 115
Making a compressed-air rocket from drinking straws. In: Goldstein-Jackson, Experiments, pp. 34-35
Model rocketry for the electronics experimenter. Pop Elec, June '73, pp. 26-30
Olney, Out to Launch -- about building and flying model rockets, including rockets from starters' kits and rockets from scratch
Transistorized model-rocket light-flasher circuit. Pop Elec, Mar. '81, p. 100
Water-powered rocket (sold cheaply in many toy and hobby stores); how to experiment with such a rocket. In: Simon, How to Be a Space Scientist, pp. 13-14

ROMAN CANDLES
See FIREWORKS

ROOTS (BOTANY)
See also OSMOSIS; PLANTS

Do roots seek water? In: Nelson, Science, p. 218
Geotropism - plant roots grow downward, responding to gravity. In: Brown, 666 Science Tricks & Expts., pp. 139-140
How do roots absorb water? Demonstration of osmosis using a carrot. In: Nelson, Science, p. 217
How roots respond to gravity. In: Baldini, Student Science Activities, pp. 160-161

ROOTS (BOTANY) (continued)

Hydrotropism - seeking of water by plant roots. In: Brown, 666 Science Tricks & Expts., p. 139

In which direction do roots grow? In: Nelson, Science, p. 216

Observing root hairs. In: Brown, 666 Science Tricks & Expts., pp. 143-144

Studying a typical taproot. In: Baldini, Student Science Activities, pp. 150-151

Upsidedown roots - experiment in the direction of root growth. In: Penrose, Dr. Zed's Brilliant, pp. 52-53

Watch roots grow in a jar; what happens if the jar is inverted? In: Brown, 666 Science Tricks & Expts., p. 133

ROTATION, OPTICAL

See OPTICAL ROTATION

ROTATIONAL MOTION

See also, e.g., ANGULAR MOMENTUM; CENTRIFUGAL FORCE; CENTRIPETAL FORCE; MOMENTS OF INERTIA; MOTION; ORBITS; PRECESSION; TACHOMETER; TOP; TORQUE; VORTEX MOTION; and other related headings

Cam (device to convert rotary to linear motion). In: Clarke, Encyclopedia of How It Works, pp. 35-36

Delights of the "wobbler", a coin or cylinder that precesses as it spins. Sci Am, Oct. '82, pp. 184, 186, 188, 190, 192, 194

Experiments with rotary motion - motion on a turntable, mapping the motion of a wheel, lifting with a wheel, etc. In: Gardner, Moving Right Along, pp. 100-107

Making an Indian drill with a broomstick and string, and a magic propeller by notching a stick. In: Brown, 666 Science Tricks & Expts., pp. 38-41

Mysterious "rattleback": stone that spins in one direction and then reverses. Sci Am, Oct. '79, pp. 172-174, 176, 179, 182-183, 186

Physics of spinning tops, including some far-out ones. Sci Am, Mar. '81, pp. 182, 184, 187-188, 190, 192, 194

Thinking about physics while scared to death (on a falling roller coaster) - the physics of amusement park rides. Sci Am, Oct. '83, pp. 162-164, 167-170

The Tippe Top. Sci Am, Oct. '79, pp. 183-184, 186

RUBBER

Rubber is porous: water vapor can diffuse through rubber. Sci Teach, Apr. '81, p. 25

Two rubber band demonstrations, one involving contraction of a rubber band on heating and the second involving warming of the band on stretching. In: Brown, 666 Science Tricks & Expts., pp. 285-286

RUST

Cathodic protection -- corrosion demonstrations with a number of metals, including zinc, tin and iron. In: Brown, 666 Science Tricks & Expts., pp. 358-360

Electrochemical process of rusting -- experiment to demonstrate that rusting is an electrochemical action. In: Morgan, Adventures in Electrochemistry, pp. 259-263

Hot iron coated with powdered sulfur is inserted into a jar of oxygen -- reddish-brown iron (ferric) oxide is produced. In: Morgan, Adventures in Electrochemistry, pp. 216-217

Oxidation demonstrated through the rusting of steel wool. In: Baldini, Student Science Activities, pp. 96-97

RUST (continued)
Rust -- demonstration of oxygen consumption in rusting of steel wool. In: Tuey, How to Be, pp. 10-11
What is iron rust? Demonstration of the rusting of iron. In: Nelson, Science, p. 14

SALAMANDERS
Fly and worm farms -- how to raise fruit flies and meal worms to feed terrarium animals such as tree frogs, salamanders, baby snakes, and toads. In: Stein, Science Book, pp. 24-25
Newts, as pets in a jar. In: Simon, Pets, pp. 44-47, 90-91

SALIVA
See also DIGESTION

How saliva helps in the digestion of foods. In: Baldini, Student Science Activities, pp. 114-115
Starchy crackers -- iodine test for starch, and the effect of saliva on starch. In: Brown, 666 Science Tricks & Expts., p. 138

SALT (COMMON OR TABLE SALT)
See SODIUM CHLORIDE

SALTPETER
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SALTS
See the names of specific salts or groups of salts, e.g., CHLORIDES; SALTS, ORGANIC; SODIUM CHLORIDE; SULPHATES

SALTS, ORGANIC
Potentiometric titration of organic salts in glacial acetic acid. In: Skoog, Fundamentals, pp. 753, 755-756, and chapter 17

SAND
Crystallization is useful to chemists as a means of separating substances - demonstrated with sand/salt experiment. In: Morgan, First Chemistry Book, pp. 45-46
How can we separate a mixture of sugar and sand? In: Nelson, Science, p. 9
Separate salt and sand by dissolution. In: Brown, 666 Science Tricks & Expts., pp. 333-334
Why do particles of sand and mud stick together when they are wet? Sci Am, Jan. '82, pp. 174-180

SATELLITE TRACKING
See ARTIFICIAL SATELLITES - TRACKING

SATELLITES
See ARTIFICIAL SATELLITES; MOON; PLANETS; names of specific planets, e.g., MARS (PLANET)

SATELLITES, ARTIFICIAL
See ARTIFICIAL SATELLITES

SATURN

SATURN (PLANET)
Photographing planets. In: Mayall, Skyshooting, pp. 109-117

SAWFLIES (INSECTS)
Sawflies -- classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 254-261

SAWTOOTH GENERATORS
See GENERATORS, ELECTRONIC

SCALES (WEIGHING INSTRUMENTS)
Build your own scale. In: Brown, 666 Science Tricks & Expts., pp. 43-45
Constructing a scale using an elastic band and a cardboard tube, and experimenting with a simple pulley. In: Tuey, How to Be, pp. 44-47
Homemade precision balance. In: Lanners, Secrets, pp. 24-25
How can we make a simple scale? In: Nelson, Science, p. 171
How to make scales for chemistry experiments. In: Cherrier, Fascinating... Chemistry, pp. 11-13
"Repulsive" platform balance, using force of magnetic repulsion. Sci Teach, Mar. '74, pp. 44-45
Weighing machines. In: Clarke, Encyclopedia of How It Works, pp. 238-241

SCHLIEREN PHOTOGRAPHY
Air flash lamp advances color schlieren photography. Sci Am, Aug. '74, pp. 104-109, 116

SCIENCE - METHODOLOGY
Bragg, Principles of Experimentation and Measurement
-includes the following:
1. The place of experimentation and measurement in science and technology, pp. 1-6;
2. Defining the problem, pp. 7-19;
3. The mechanics of measurement, pp. 20-31;
4. Statistics, pp. 32-71;
5. Treatment of results, pp. 72-104;
6. Reporting results, pp. 105-135;
7. Example reports, pp. 136-162;
-this book is mathematically beyond high school level. Much of the material, however, is accessible and the bright student will find the material a challenge

Gutnik, How to Do a Science Project and Report
-included are chapters on observation, classification of properties, making an inference and prediction, the hypothesis, testing a hypothesis, interpreting data, drawing conclusions and identifying variables, the formal report, and ideas for projects

Moorman, How to Make Your Science Project Scientific
-includes short chapters on controlled experiments, surveys, measurement, evaluating results and reporting

Propagation of uncertainty -- dealing with significant digits in calculations. In: Zebrowski, Fundamentals of Physical Measurement, pp. 113-116

VanDeman, Nuts & Bolts: A Matter of Fact Guide to Science Fair Projects
-includes sections on topic choice, library research, getting professional help, note taking, gathering materials, experimentation, measuring, drawing conclusions, the research paper, presentation and exhibiting. Also includes list of award-winning projects, and names and addresses of potential information sources, including associations, corporations, and science centers

SCIENCE - METHODOLOGY (continued)

Webster, How to Do a Science Project
-includes chapters on problem selection, scientific method, preliminary work, research, written and oral reporting, project display and a list of books with project ideas

Zebrowski, Fundamentals of Physical Measurement
-deals at quite an advanced level with topics such as measurement error, significant figures, statistics, data tables and graphs. Would be of use to the keen senior high school student

SCIENCE PROJECTS

See also SCIENCE - METHODOLOGY

American Chemical Society, A Chemistry Project from Start to Finish
-this booklet provides very general information

Beller, So You Want to Do a Science Project!
-this is a "guide to selecting, researching, and doing science projects - some not too difficult, others more sophisticated - with lists of projects in various scientific areas"

Forty-five innovative science projects - summaries of projects chosen by the U.S. National Science Teachers Association. Sci Teach, Feb. '75, pp. 38-41; Mar. '75, pp. 39-42; Apr. '75, pp. 36-40; May '75, pp. 49-53; and June '75, entire issue, pp. 4-48

Gutnik, How to Do a Science Project and Report
-see description of this book under the heading SCIENCE - METHODOLOGY

How to custom design plastic cases for electronics projects. Pop Elec, Sept. '77, pp. 81-84

How to dress up your electronics projects. Pop Elec, Nov. '77, pp. 53-55

Over-the-counter chemistry -- bringing aspirin, antacids, and detergent to class; some of the ideas here could be used for chemistry projects. Sci Teach, Nov. '82, pp. 45, 47-48

Several questions concerning animal behavior that could be used for behavioral research projects with animal pets. Sci Teach, Sept. '83, p. 41

So you want to do research! Project pointers. Sci Teach, Apr. '73, pp. 36-37

Some inside tips on science project choice, preparation and presentation. In: Wels, Science, pp. 153-154

Use old television cabinet as a display case for an electronics project, or build your own project display box. In: Giant Handbook, pp. 233-234, 243, 245-247

VanDeman, Nuts & Bolts: A Matter of Fact Guide to Science Fair Projects
-see description of this book under the heading SCIENCE - METHODOLOGY

Webster, How to Do a Science Project
-see description of this book under the heading SCIENCE - METHODOLOGY

SCREWS

Screws. In: Clarke, Encyclopedia of How It Works, p. 188

Screws. In: Clarke, Encyclopedia of How It's Made, pp. 166-169

SEEDS

See also PLANTS

Aerodynamics of the samara: winged seed of the maple, the ash and other trees. Sci Am, Oct. '81, pp. 226-228, 230, 233, 235-236, 238

Demonstration that germinating seeds give off carbon dioxide gas. In: Baldini, Student Science Activities, pp. 158-159

From the little acorn - ideas on studying acorns. Sci Teach, Dec. '77, p. 31

Grow a pine tree from the seeds from a pine cone. In: Brown, 666 Science Tricks & Expts., pp. 129-130

SEEDS

SEEDS (continued)

Growing corn from seed, including fertilizing the corn. In: Stein, Science Book, pp. 104-108

How do seeds change into plants? Experiment involving staggered planting of seeds over several weeks. In: Nelson, Science, p. 222

How do we test seeds for germination? In: Nelson, Science, p. 212

How does air affect germination? In: Nelson, Science, p. 214

How does light affect germination? In: Nelson, Science, p. 215

How does water affect germination? In: Nelson, Science, p. 213

How much pressure a seedling exerts as measured by breaking through wax. In: Baldini, Student Science Activities, pp. 159-160

How to plant a seed; how to transplant a seedling. In: Stein, Science Book, pp. 101-103

Jar germinator. In: Herbert, Mr. Wizard's, p. 33

Magnetobiology: investigations of magnetism and plant growth. Sci Teach, May '73, pp. 57-60

Making and using a seed germination tester. In: Penrose, Dr. Zed's Brilliant, pp. 10-11

Methods of germinating seeds - plant greenhouses, beaker germination, glass plate germination. In: Baldini, Student Science Activities, pp. 155-157

Seeds. In: McPhee, Gardening, pp. [22-23]

Sponge garden -- sponge is an ideal surface on which to grow seeds. In: Herbert, Mr. Wizard's, p. 56

Upsidedown roots - experiment in the direction of root growth. In: Penrose, Dr. Zed's Brilliant, pp. 52-53

SEISMOMETERS

See also EARTHQUAKES

Electronic stratagems are the key to making a sensitive seismometer. Sci Am, Sept. '75, pp. 182-188, 206

How to build a simple seismograph to record earthquake waves at home. Sci Am, July '79, pp. 152, 155-156, 158-162, and correction to illustration Nov. '79, p. 204

Model seismometer - simple apparatus to detect vibrations and record them on a roll of paper. In: Rosenfeld, Science, pp. 27-28, 32-35, 166

Practical seismograph tracks tremors. Sci Teach, Nov. '77, pp. 43-45

Seismograph -- how it works. In: Papallo, What Makes It Work, pp. 14-15

Sensitive mercury tiltmeter that serves as a seismometer. Sci Am, Nov. '73, pp. 124-129, 136

SENSES AND SENSATION

See also, e.g., HEARING; REACTION TIME; SMELL; TASTE; TOUCH; VISION; and names of sense organs, e.g., EAR, EYE

How many senses do we have? In: Nelson, Science, p. 289

Human senses: a series of problems for investigation. Some of the problems are indexed separately as well. In: Nelson, Science, pp. 289-301

SEPARATION (TECHNOLOGY)

See also, e.g., CHROMATOGRAPHIC ANALYSIS; CRYSTALS AND CRYSTALLIZATION; DIFFUSION; DISTILLATION; ELECTROPHORESIS; OSMOSIS; PRECIPITATION (CHEMISTRY); and other related headings

Crystallization is useful to chemists as a means of separating substances - demonstrated with sand/salt experiment. In: Morgan, First Chemistry Book, pp. 45-46

SEPARATION (TECHNOLOGY) (continued)
How can we separate a mixture of sugar and sand? In: Nelson, Science, p. 9
Separate salt and sand by dissolution. In: Brown, 666 Science Tricks & Expts., pp. 333-334

SEXTANT
Cross-staff, primitive equivalent of the sextant - construction and use for latitude and astronomical measurements. Sci Am, Nov. '74, pp. 126-127, 134, 146
Sextant. In: Clarke, Encyclopedia of How It Works, pp. 192-193

SHADOW PICTURES
Direct shadow demonstration (shadowgraphy) - simple method using laser light by which small changes in the refractive index of air can be made visible. In: Kallard, Exploring, pp. 61-62

SHORT WAVE RADIO
See RADIO, SHORT WAVE

SHRIMPS
Brine shrimp, as pets in a jar. In: Simon, Pets, pp. 78-81, 90-91

SIGNIFICANT DIGITS IN SCIENTIFIC CALCULATIONS
See PHYSICAL MEASUREMENTS; SCIENCE - METHODOLOGY

SILICATES
Chemical flower garden through formation of colorful silicates. In: Chen, Entertaining, pp. 82-83

SILVER
See also SILVERING; TARNISH

Clean the silver using aluminum foil and bicarbonate of soda. In: Stein, Science Book, p. 220
Making a silver tree with copper wire and silver nitrate solution. In: Chen, Entertaining, p. 81
Silver electroplating. In: Giant Handbook, pp. 268-273
Silver "tree" - electrochemical experiment using a silver nitrate solution and copper. In: Morgan, Adventures in Electrochemistry, p. 146
Sulfur in eggs and mustard will tarnish silver, but will not affect a stainless steel spoon. In: Brown, 666 Science Tricks & Expts., p. 356
Using aluminum to remove silver tarnish. In: Herbert, Mr. Wizard's, p. 61
Why silverware tarnishes - demonstration of the effect of sulfur on silver; how to remove tarnish from bright finish silver and pewter. In: Morgan, First Chemistry Book, pp. 156-159

SILVER NITRATE
Silver nitrate and its solutions; preparation of standard 0.1-F silver nitrate for volumetric analysis. In: Skoog, Fundamentals, p. 726

SILVERING
See also ELECTROPLATING

Chemical silvering of glass. Sci Teach, Jan. '75, p. 36

SIMPLE MACHINES

SIMPLE MACHINES
See also LEVERS; PULLEYS; SCREWS; WHEELS

Simple machines, including workings of a wheel and axle, levers, inclined planes, and pulleys, and also the effects of friction, and inertia and momentum. In: Nelson, Science, pp. 132-142

SIPHONS
Demonstrations of variation of pressure with height and the working of a siphon. In: Richards, Science Magic, p. 19
How can we make a fountain siphon? In: Nelson, Science, p. 38
How does a siphon work? In: Nelson, Science, p. 37
Siphon water jet, or how atmospheric pressure makes siphons work. In: Cherrier, Fascinating...Physics, pp. 24-25
Using a siphon. In: Simon, Projects, pp. 36-37

SIRENS
See also ELECTRIC ALARMS

Electronic siren. Pop Elec, Dec. '73, p. 58, and addition Mar. '74, p. 9
Electronic siren, using a transistor. In: Friedman, 99 Practical, pp. 29-30
Piezoelectric speaker siren. Computers & Electronics, Dec. '83, pp. 89-92
Siren - can be used as a doorbell. In: Mendelson, 103 Simple, p. 35
Siren generator circuit. Pop Elec, Oct. '74, p. 90
Warbling-wailing siren using integrated circuit. In: Duncan, Adventures, pp. 24-27

SKIN
Electronic skin temperature thermometer - suggested as useful in biofeedback activities. Pop Elec, Sept. '75, pp. 62-63
Examining your cells with a microscope. In: Baldini, Student Science Activities, pp. 112-113
Locating skin sensors. In: Stein, Science Book, pp. 168-170
Pin touch-tester. In: Herbert, Mr. Wizard's, p. 83
Taste experiments: mapping the tongue; what skins can taste. In: Stein, Science Book, pp. 213-215

SKINNER BOX
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SKY, COLOR OF
See also SUNSET PHENOMENA

Red sunset and blue sky with a shoe box. Sci Teach, Feb. '74, p. 47

SLIDE RULE
Slide rule. In: Clarke, Encyclopedia of How It Works, pp. 194-196

SLIDES
See PHOTOGRAPHY - FILMS

SMELL
How do we use our sense of smell? Classroom demonstration involving detection of odors of various substances at various distances, etc. In: Nelson, Science, p. 299
Smell without taste: artificial strawberry 'flavoring'. In: Cobb, More Science Experiments, pp. 105-106

SMELL (continued)
Taste without smell: apple versus potato versus onion. In: Cobb, More Science Experiments, pp. 106-109
Tasteless coffee - demonstration of how important smell is in our perception of foods. In: Brown, 666 Science Tricks & Expts., pp. 118-119

SMOKE
See also FIRE

Gas/smoke detector - the Taguchi gas sensor. In: Fox, Unique Electronic, pp. 93-97
Low-cost smoke and/or gas detector. In: Giant Handbook, pp. 344-345
What is smoke? Demonstration with a candle and a piece of metal. In: Nelson, Science, p. 62
What plumes of smoke tell about the structure of the atmosphere. Sci Am, May '78, pp. 162, 164-168, 170-172

SMOKE DETECTORS
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SNAILS
Pleasures and problems of raising snails in the home. Sci Am, Feb. '75, pp. 104-107, 115
Pond snails as pets in a jar. In: Simon, Pets, pp. 30-33, 90-91

SNAKES
Care and feeding of snakes; snaking through science. Sci Teach, Apr. '83, pp. 20-23, and comments Nov. '83, pp. 58-60
Fly and worm farms - how to raise fruit flies and meal worms to feed terrarium animals such as tree frogs, salamanders, baby snakes and toads. In: Stein, Science Book, pp. 24-25
How do we make a terrarium for reptiles? In: Nelson, Science, p. 270

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Effects of wind on snow. Sci Teach, Oct. '73, pp. 47-50
Photomicrography of snow crystals. In: Schaefer, A Field Guide, pp. 297-300
Preparation of snow crystal replicas. In: Schaefer, A Field Guide, pp. 288-290
Snow sampling: student project for determination of urban air-borne particulate distribution. Sci Teach, Nov. '73, pp. 38-39

SNOWFLEA (INSECT)
Snow flea - classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 284-288

SNYDER TEST
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SOAP
Bright colors in soap film are a lesson in wave interference. Sci Am, Sept. '78, pp. 232-236, 240, 242
Chemical trick using soap and phenolphthalein indicator - soapy water turns bright red. In: Shalit, Science, p. 40
Hard and soft waters; action of soap in hard and in soft waters. In: Morgan, First Chemistry Book, pp. 64-67
Making salad-oil soap. In: Herbert, Mr. Wizard's, p. 31
Method of laying a thin film on a surface having a higher refractive index than the film; colors in thin films. Sci Am, June '79, pp. 198-200, 202

SOAP (continued)
Soap and detergents make water wetter. In: Morgan, First Chemistry Book, pp. 163-168
Soap circle: surface tension. In: Stein, Science Book, p. 167
Soap defogger demonstration shows action of surface tension. In: Herbert, Mr. Wizard's, p. 49
Soap tricks demonstrating surface tension. In: Herbert, Mr. Wizard's, p.46

SOAP BUBBLES
See also BUBBLES; PLASTICS; POLYMERS AND POLYMERIZATION

Blowing bubbles. In: Richards, Science Magic, p. 25
Making giant bubbles several feet in diameter. In: Herbert, Mr. Wizard's, p. 48
Painting pictures with bubbles. In: Goldstein-Jackson, Experiments, pp.134-135
Soap bubbles for atmospheric studies - local air flow, turbulence, convection, bubbles experimented with in a cold chamber, etc. In: Schaefer, A Field Guide, pp. 290-293
Super rainbow bubbles. In: Penrose, Dr. Zed's Dazzling, pp. 4-5
Voltameter apparatus produces chlorine and hydrogen from sodium chloride solution, and can be constructed to make explosive soap bubbles. In: Cherrier, Fascinating...Chemistry, pp. 86-87

SODIUM
Determination of sodium, potassium, and calcium in mineral waters. In: Skoog, Fundamentals, p. 765 and chapter 25
Fire on water -- pea-sized piece of potassium or sodium on water will produce hydrogen which ignites from heat of reaction. In: Chen, Entertaining, p. 50
Sodium light in methyl alcohol flame. In: Brown, 666 Science Tricks & Expts., p. 312

SODIUM ACETATE
Lot's wife: growing a pillar of sodium acetate from a supersaturated solution. Sci Teach, Apr. '82, p. 56

SODIUM BICARBONATE
Clean the silver using aluminum foil and bicarbonate of soda. In: Stein, Science Book, p. 220
Easy oxygen from hydrogen peroxide and baking soda. In: Brown, 666 Science Tricks & Expts., pp. 361-362
Make a salt from vinegar and baking soda. In: Brown, 666 Science Tricks & Expts., p. 354

SODIUM CARBONATE
Crystal columns (stalactites and stalagmites) from washing soda. In: Amery, KnowHow...Experiments, p. 9
Grow your own crystals with salt, sugar or washing soda. In: Amery, KnowHow...Experiments, p. 8
Water is a part of some crystal structures - experiment using washing soda to demonstrate water of hydration. Also discussion of plaster of Paris. In: Morgan, First Chemistry Book, pp. 46-50

SODIUM CHLORIDE
Crystallization is useful to chemists as a means of separating substances - demonstrated with sand/salt experiment. In: Morgan, First Chemistry Book, pp. 45-46
Dissolving trick - salt occupies less volume in solution than when dry. In: Brown, 666 Science Tricks & Expts., p. 331

SODIUM CHLORIDE (continued)

Electrolysis of a sodium chloride solution. In: Morgan, Adventures in Electrochemistry, pp. 195-199

Electrolysis of salt (sodium chloride). In: Morgan, First Chemistry Book, pp. 146-149

Electrolysis of sodium chloride to produce sodium hydroxide. In: Morgan, Adventures in Electrochemistry, pp. 199-200

Electrolytes - demonstration with sugar and salt solutions. In: Brown, 666 Science Tricks & Expts., pp. 348-349

Electronic salt meter to check food for salt content. Pop Elec, Oct. '74, pp. 33-36, and comment Feb. '75, p. 6

Grow a salt garden. In: Brown, 666 Science Tricks & Expts., p. 333

Grow your own crystals with salt, sugar or washing soda. In: Amery, KnowHow...Experiments, p. 8

How to make a bleach (sodium hypochlorite solution) in a voltameter by electrolyzing a sodium chloride solution. In: Cherrier, Fascinating... Chemistry, p. 88

Invisible writing using a saturated salt solution. In: Brown, 666 Science Tricks & Expts., p. 91

Making crystals of rock salt. In: Morgan, First Chemistry Book, pp. 39-40

Making salt crystals. In: Morgan, First Chemistry Book, p. 38

Separate salt and sand by dissolution. In: Brown, 666 Science Tricks & Expts., pp. 333-334

Voltameter apparatus produces chlorine and hydrogen from a sodium chloride solution and can be constructed to make explosive soap bubbles. In: Cherrier, Fascinating...Chemistry, pp. 86-87

SODIUM HYDROXIDE

Electrolysis of sodium chloride to produce sodium hydroxide. In: Morgan, Adventures in Electrochemistry, pp. 199-200

SODIUM HYPOCHLORITE

Chlorine breaks up water molecules and liberates oxygen; oxidizing action of sodium hypochlorite solution is speeded up by a small amount of vinegar (acid). In: Morgan, First Chemistry Book, pp. 153-154

How to make a bleach (sodium hypochlorite solution) in a voltameter by electrolyzing a sodium chloride solution. In: Cherrier, Fascinating... Chemistry, p. 88

Two bleaches - sodium hypochlorite and sulfur dioxide. In: Brown, 666 Science Tricks & Expts., pp. 360-361

Using sodium hypochlorite solution to perform a bleach trick in which a red solution turns clear. In: Herbert, Mr. Wizard's, p. 44

SODIUM SULPHATE

Solar energy storage - Glauber's salt. In: Norton, Solar Energy, pp. 73-77

SODIUM THIOSULPHATE

Chemical color reaction: a color-indicating-time reaction -- ferric chloride and sodium thiosulfate solutions. In: Chen, Entertaining, pp. 33-34

Crystals from photographer's hypo (sodium thiosulphate) solution. In: Brown, 666 Science Tricks & Expts., p. 357

Form supersaturated photographer's hypo (sodium thiosulphate) solution, then induce crystallization to form a beautiful pattern. In: Brown, 666 Science Tricks & Expts., p. 358

How to remove iodine stains -- experiment using "hypo" (sodium thiosulfate). In: Morgan, First Chemistry Book, pp. 95-97

SODIUM THIOSULPHATE

SODIUM THIOSULPHATE (continued)
Magic tea glass - trick using sodium thiosulfate and iodine. In: Shalit, Science, p. 38
Pollution to order: sulfur dioxide from photographer's hypo and lemon juice. In: Brown, 666 Science Tricks & Expts., p. 343
Preparation and standardization of sodium thiosulfate solutions. In: Skoog, Fundamentals, pp. 363-365 and 748-749
Sulfur dioxide from photographer's hypo and lemon juice. In: Brown, 666 Science Tricks & Expts., p. 363

SOIL EROSION
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SOIL MICRO-ORGANISMS
Sterilize soil by heating. In: Brown, 666 Science Tricks & Expts., pp. 131-132

SOIL MOISTURE
Are some soils better than others for holding water? In: Nelson, Science, p. 347
Experiment with water absorption by three types of soil. In: Brown, 666 Science Tricks & Expts., pp. 116-117
The groundwater terrarium: geology on a small scale. Sci Teach, May '82, pp. 44-46
Is there moisture in dry soil? In: Rosenfeld, Science, pp. 121, 124-125, 170

SOIL TEMPERATURE
Soil temperature experiment comparing ordinary soil with soil covered with sod. In: Brown, 666 Science Tricks & Expts., pp. 133-134

SOILS
Do all plants like the same kind of soil? Experiment with four kinds of soil. In: Nelson, Science, p. 210
How do soils differ? Experiment with clay and sand soils. In: Nelson, Science, p. 211
How does moving air affect our soil? In: Nelson, Science, p. 348
Sterilize soil by heating. In: Brown, 666 Science Tricks & Expts., pp. 131-132

SOILS - ANALYSIS
Heavy metal analysis - heavy metal concentration in a soil sample. Sci Teach, May '76, p. 49
Testing soil for acid (using litmus paper). In: Morgan, First Chemistry Book, pp. 116-117

SOLAR BATTERIES
See also ELECTRIC BATTERIES; PHOTOELECTRIC CELLS

Silicon solar cell. Pop Elec, Nov. '76, pp. 110-111
The solar cell. In: Traister, First Book, pp. 52-54
Solar cells/solar panels and applications. In: Wels, Science, pp. 116-120
Sun powered 40-meter transmitter. In: Mendelson, 103 Simple, p. 69

SOLAR CELLS
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SOLAR COOKERY
Brewing solar tea. Sci Teach, Jan. '80, pp. 35-36
Make your own solar cooker - from paper cups, aluminum foil, etc. In: Taylor, Kids' Whole Future Catalog, p. 209
Making a simple solar furnace (or camp cooker) using a Fresnel lens. In: Wels, Science, pp. 55-56 [compiler's note: figures 2 and 3 for these projects missing in copy of book examined, although no pages missing from book]
Solar cooker. In: Metos, Exploring with Solar Energy, pp. 40-41

SOLAR ECLIPSES
See ECLIPSES, SOLAR

SOLAR ENERGY
Build a solar controller - electronic temperature comparator for solar energy systems or attic fans. Pop Elec, July '77, pp. 69-70, and comment Oct. '77, p. 14
Demonstrating the energy of the sun's rays with a magnifying glass. In: Rosenfeld, Science, pp. 48, 51-53, 167
Determining the heat absorbed by a closed automobile left in the sun. In: Norton, Solar Energy, pp. 9-13
Determining the latent heat of a substance - experiment using ice; to measure the effect of incoming solar radiation on the rate of melting ice. In: Norton, Solar Energy, pp. 16-19
Digital clock and thermometer projects use the sun or artificial light to recharge batteries. Pop Elec, Dec. '77, pp. 41-47
Effect of a converging lens on energy collection; to measure the energy-concentrating effectiveness of a converging lens using the direct rays of the sun. In: Norton, Solar Energy, pp. 31-33
Effect of a converging lens on temperature; to measure the temperature achieved by concentrating the sun's direct rays with a converging lens. In: Norton, Solar Energy, pp. 29-30
How to use solar energy to recharge your batteries. Pop Elec, Aug. '82, pp. 55-58
Make your own sun-dried fruit. In: Taylor, Kids' Whole Future Catalog, p. 210
Measure the sun's energy with a solar radiometer. Pop Elec, Dec. '76, pp. 45-47 and addition May '78, p. 6
Miniature solar collector. In: Giant Handbook, pp. 403-407
Salad-bowl solar reflector (lined with aluminum foil). In: Herbert, Mr. Wizard's, p. 79
Solar constant; using data given to investigate the variation through the years in the earth's receipt of solar energy. In: Norton, Solar Energy, pp. 94-95
Solar energy collection; a series of problems based on data presented. In: Norton, Solar Energy, pp. 99-100
Solar energy demonstrator. In: Giant Handbook, pp. 152-159
Solar energy flat-surface system. In: Giant Handbook, pp. 164-167
Solar energy model. In: Giant Handbook, pp. 398-403
Solar energy storage - electrochemical; to measure overall efficiency of a solar electrical energy collector and storage system. In: Norton, Solar Energy, pp. 78-81
Solar energy storage - Glauber's salt. In: Norton, Solar Energy, pp. 73-77
Solar energy storage - gravel; to measure the heat storage capacity and the efficiency of a gravel storage unit. In: Norton, Solar Energy, pp. 68-72
Some simple investigations of solar energy: temperature inside an automobile, experimenting with converging lenses, the greenhouse effect. In: Metos, Exploring with Solar Energy, pp. 30-39

SOLAR ENERGY

SOLAR ENERGY (continued)

Studies with the solarimeter; to measure the amount of solar energy reaching earth and to determine its variability. In: Norton, Solar Energy, pp. 20-26

SOLAR ENGINES

The solar engine, and building a simple expansion solar engine. In: Metos, Exploring with Solar Energy, pp. 48-54

SOLAR FLARES

See also SUNSPOTS

New kind of spectrohelioscope for observing solar prominences. Sci Am, Mar. '74, pp. 110-115, 124 (also in Light and Its Uses, pp. 136-141)

SOLAR FURNACES

See SOLAR HEATING

SOLAR HEATING

See also SOLAR WATER HEATERS

An air-heating solar collector. In: Norton, Solar Energy, pp. 63-67

Brewing solar tea. Sci Teach, Jan. '80, pp. 35-36

Burning mirror, or how to increase the sun's radiation enough to ignite paper - basis of solar furnace operation. In: Cherrier, Fascinating... Physics, p. 38

Construction of cheap solar panels using heat exchanger panels from discarded domestic refrigerators. Sci Teach, Oct. '81, p. 49

Dark heat -- demonstration that a black can will absorb sunlight more readily and will radiate heat away more quickly than a bright metal can. In: Brown, 666 Science Tricks & Expts., p. 283

Effect of roof overhang on the summer temperature of buildings; to determine the effect that roof overhang has on the air temperature of an enclosed air space. In: Norton, Solar Energy, pp. 52-54

Experimenting with solar collection and radiation cooling. Sci Teach, Sept. '80, pp. 29-31

Large solar energy collector. In: Giant Handbook, pp. 172-176

Making a simple solar furnace (or camp cooker) using a Fresnel lens. In: Wels, Science, pp. 55-56 [compiler's note: figures 2 and 3 for these projects were missing in copy of book examined, although no pages were missing from book]

Making a solar furnace using a Fresnel lens. In: Metos, Exploring with Solar Energy, pp. 43-45

Making solar collectors. Sci Teach, Jan. '78, pp. 33-35

Salad-bowl solar reflector (lined with aluminum foil). In: Herbert, Mr. Wizard's, p. 79

Simple solar heater using cardboard boxes. In: Gardner, Moving Right Along, pp. 142-143

Solar cooker. In: Metos, Exploring with Solar Energy, pp. 40-41

Solar demonstration residence; exercises to be performed with data given. In: Norton, Solar Energy, pp. 103-105

Solar furnace: a powerful furnace with which you can boil water in a few seconds or run a small steam turbine. In: Cherrier, Fascinating... Physics, pp. 40-41

Solar furnace: a quick, economical project. In: Cherrier, Fascinating... Physics, p. 39

SOLAR HEATING (continued)

Solar-heated model house. In: Spooner, Sunpower, pp. 36-48

Solar heating, or how to use the sun around the house - construction of a simple solar heater. In: Cherrier, Fascinating...Physics, pp. 88-90

Solar oven. In: Spooner, Sunpower, pp. 57-65

Solar still. In: Metos, Exploring with Solar Energy, pp. 46-47

Solar still. In: Spooner, Sunpower, pp. 49-55

Student-made solar technology. Sci Teach, Apr. '78, pp. 20-24

Use of solar energy in heating water; to demonstrate that useful heat can be produced from solar energy without production of air, water, or land pollution. In: Norton, Solar Energy, pp. 58-62

SOLAR RADIATION

Construction of the Volz sun photometer -- used to determine the coefficient of atmospheric turbidity. In: Norton, Solar Energy, pp. 46-51

Determining heating degree-days per year. In: Norton, Solar Energy, pp.14-15

Insolation; investigating solar radiation using the radiation data given. In: Norton, Solar Energy, pp. 96-98

Measuring atmospheric turbidity by means of a sun photometer and demonstrating that small particles suspended in the atmosphere reduce visibility by increasing turbidity. In: Norton, Solar Energy, pp.37-45

Solar constant; using data given to investigate the variation through the years in the earth's receipt of solar energy. In: Norton, Solar Energy, pp. 94-95

Solar radiation; keeping a record of daily solar radiation at a particular location. In: Norton, Solar Energy, pp. 101-102

Studies with the radiometer; to measure the intensity of solar radiation using a vane-type radiometer. In: Norton, Solar Energy, pp. 34-36

Studies with the solarimeter; to measure the amount of solar energy reaching earth and to determine its variability. In: Norton, Solar Energy, pp. 20-26

Years, days, and solar rays: new way to measure seasonal and diurnal changes in the amount of solar radiation reaching the earth's surface, using a light meter and a globe. Sci Teach, Oct. '83, pp. 40, 45

SOLAR SYSTEM

See also names of individual bodies in the solar system, e.g., EARTH, MARS (PLANET), MOON, SUN

How fast is our solar system travelling in the Milky Way? Sci Teach, May '83, p. 51

Scale model of the planets (1" = 10,000 miles). In: Baldini, Student Science Activities, pp. 56-57

Scale of distances for the planets. In: Baldini, Student Science Activities, pp. 54-56

SOLAR WATER HEATERS

How a solar water heater works (with many drawings to aid in construction). In: Wels, Science, pp. 106-115

Solar still. In: Metos, Exploring with Solar Energy, pp. 46-47

Solar still. In: Spooner, Sunpower, pp. 49-55

Solar water heater. In: Spooner, Sunpower, pp. 17-35

Solar water heater - a sunny alternative. Sci Teach, May '78, p. 45

Tapping the sun - blueprint for an experimental water heater. Sci Teach, Jan. '82, pp. 28-33

Use of solar energy in heating water; to demonstrate that useful heat can be produced from solar energy without production of air, water, or land pollution. In: Norton, Solar Energy, pp. 58-62

SOLDER AND SOLDERING

SOLDER AND SOLDERING
Dip soldering printed circuit boards. In: Giant Handbook, pp. 253-257
How to solder. In: Malcolm, How to Build Electronic Projects, pp. 58-71
Inexpensive soldering pistol. In: Giant Handbook, pp. 241-244
Solder & soldering: what goes into a good electrical connection. Pop Elec, Mar. '73, pp. 47-49
Soldering electronic components. In: Traister, First Book, pp. 37-38
Some soldering tips. In: Giant Handbook, pp. 233-235
Successful soldering. Pop Elec, Sept. '81, pp. 67-69, 74

SOLENOIDS
See also MAGNETS

Checking the magnetic polarity of a solenoid. In: Graf, Safe and Simple, pp. 91-92
Four electromagnetic projects - magnetization of metal objects, solenoid action, telegraph operation and relay switching. In: Giant Handbook, pp. 295-297
Solenoid. In: Clarke, Encyclopedia of How It Works, pp. 196-197

SOLIDS
Can a liquid be changed to a solid? In: Nelson, Science, p. 5
Can a solid be made to change to a liquid? A liquid to a gas? In: Nelson, Science, p. 4
Do all solids melt at the same temperature? In: Nelson, Science, p. 3
Models for illustrating the states of matter. Sci Teach, Feb. '74, p.48
What are the three states of matter? In: Nelson, Science, p. 2

SOLIDS, EXPANSION OF
See EXPANSION OF SOLIDS

SOLUBILITY
How can we separate a mixture of sugar and sand? In: Nelson, Science, p. 9
K_{sp} determination using lead chloride. Sci Teach, Oct. '82, p. 58
Separate salt and sand by dissolution. In: Brown, 666 Science Tricks & Expts., pp. 333-334
Solubility - demonstration that iodine in water will pass into mineral oil when oil is shaken with the water solution. In: Brown, 666 Science Tricks & Expts., pp. 350-351
There are solvents which will dissolve substances which water does not dissolve. In: Morgan, First Chemistry Book, pp. 30-32
Water forms solutions with many substances; soluble or insoluble in water? In: Morgan, First Chemistry Book, pp. 26-28
What happens when drops of oil or other substances are placed on water? Sci Am, Dec. '83, pp. 164-170, 178

SOLUTION (CHEMISTRY)
See also, e.g., COLLOIDS; COOLING OF SOLUTIONS; DIFFUSION; ELECTROLYSIS; MIXTURES; OSMOSIS; PRECIPITATION (CHEMISTRY); SEPARATION (TECHNOLOGY); SOLUBILITY; SOLUTIONS, SUPERSATURATED; SOLVENTS; and other related headings

A dissolving trick - salt occupies less volume in solution than when dry. In: Brown, 666 Science Tricks & Expts., p. 331
Experiment demonstrating that electrochemical action can cause changes in a solution. In: Morgan, Adventures in Electrochemistry, pp. 266-267

SOLUTION (CHEMISTRY) (continued)

Solutions vary in strength; three varieties of solutions made. In: Morgan, First Chemistry Book, pp. 33-34

What happens to substances in solution when the water evaporates? Evaporation of water from a salt solution. In: Nelson, Science, p. 20

What is a solution? Demonstration using sugar, powdered milk, "postum", and powdered chocolate. In: Nelson, Science, p. 19

Which is the best solvent, hot water or cold water? In: Morgan, First Chemistry Book, pp. 34-36

SOLUTIONS, COOLING OF

See COOLING OF SOLUTIONS

SOLUTIONS, SUPERSATURATED

Form supersaturated photographer's hypo (sodium thiosulphate) solution, then induce crystallization to form a beautiful pattern. In: Brown, 666 Science Tricks & Expts., p. 358

Lot's wife: growing a pillar of sodium acetate from a supersaturated solution. Sci Teach, Apr. '82, p. 56

SOLVENTS

See also SOLUTION (CHEMISTRY)

There are solvents which will dissolve substances which water does not dissolve. In: Morgan, First Chemistry Book, pp. 30-32

Water forms solutions with many substances; soluble or insoluble in water? In: Morgan, First Chemistry Book, pp. 26-28

Which is the best solvent, hot water or cold water? In: Morgan, First Chemistry Book, pp. 34-36

SOUND

See also, e.g., DOPPLER EFFECT; HEARING; MUSICAL PITCH; NOISE; RESONANCE; SIRENS; SOUND EFFECTS; SOUND WAVES; TONE; ULTRASONIC WAVES; VIBRATION; VOICE; and other related headings

Build the surfer -- device simulates sound of surf, gentle rain or white noise to provide tranquil background. Pop Elec, June '79, pp.64-67

Can we see sound vibrations? Demonstration with knitting needle, rubber band, etc. In: Nelson, Science, p. 95

Demonstrating that sound is a wave motion. In: Rosenfeld, Science, pp. 106-107, 112, 114, 169

Experiments in "seeing" sound -- vibrating rulers, rubber bands, etc. In: Amery, KnowHow...Experiments, pp. 14-15

Experiments with surface waves on a curved surface; whispering-gallery effects. Sci Am, Oct. '78, pp. 179-180, 182-185, 188

How can sound be produced by friction? In: Nelson, Science, p. 102

How do vibrating wires make different sounds? In: Nelson, Science, p.101

MusicVision set -- sound that you can see; this project employs a purchased music "motiondizer". In: Wels, Science, pp. 17-19

Rock music sound displayed as patterns of light, using a laser. Sci Teach, Oct. '76, pp. 43-44

Series of experiments showing that sound may be caused by vibrations of an object in air. In: Rosenfeld, Science, pp. 101-104, 109-111, 114-115, 169

Sound and other vibrations - 26 groups of experiments on various aspects of vibration. In: Brown, 666 Science Tricks & Expts., pp. 15-37

Visual display of sound dynamics using laser light. In: Kallard, Exploring, pp. 50-53

SOUND

SOUND (continued)

What causes sound? What things make sound? Simple demonstrations with blades of grass, combs, tuning forks, etc. In: Nelson, Science, pp. 93-94

What makes sounds differ? Demonstration with rubber bands, string, and wire of varying thicknesses. In: Nelson, Science, p. 100

Wonders of physics that can be found in a cup of coffee or tea -- fluid dynamics, electrostatics, pitch of sound, cooling. Sci Am, Nov. '77, pp. 152, 154-158, 160, 164

SOUND - APPARATUS

See also, e.g., LOUDSPEAKERS; MEGAPHONE; MICROPHONE; TAPE RECORDERS - APPARATUS AND APPLIANCES; and other related headings

Audio volume booster overcomes outside noise. Computers & Electronics, Dec. '82, pp. 74-75

Build a guitar sound intensifier. Pop Elec, July '74, pp. 45-46

Build a super audio filter. Pop Elec, Sept. '78, pp. 74-75

Soundscope, demonstrating frequency and loudness of sound. In: Stein, Science Book, p. 180

Unit for sound detection and ranging. In: Giant Handbook, pp. 298-305

SOUND - MEASUREMENT

Amplified volume-unit (VU) meter -- audio test equipment. In: Friedman, 99 Practical, pp. 101-102

Audio level meter. Pop Elec, Oct. '81, pp. 87-91

Build a tape recorder/amplifier FET VU meter. Pop Elec, June '74, pp. 52-53

Lamp-readout VU meter to simplify audio recording. Pop Elec, Jan. '74, pp. 44-45

Sound-level meter and its use. In: Giant Handbook, pp. 321-324

Soundscope, demonstrating frequency and loudness of sound. In: Stein, Science Book, p. 180

VU meter - enables watch to be kept on audio recording levels. In: Mendelson, 103 Simple, p. 105

VU meter with no moving parts. Pop Elec, Feb. '75, pp. 40-41

SOUND - RECORDING AND REPRODUCING

See also, e.g., INTERCOMMUNICATION SYSTEMS; STEREOPHONIC SOUND SYSTEMS; TAPE RECORDERS - APPARATUS AND APPLIANCES; TELEPHONE; and other related headings

Amplified volume-unit (VU) meter -- audio test equipment. In: Friedman, 99 Practical, pp. 101-102

Audio mixer, permits two-microphone operation for audio and recording applications or for mixing microphone and radio signals into a recording machine. In: Mendelson, 103 Simple, p. 42

Build a tape recorder/amplifier FET VU meter. Pop Elec, June '74, pp.52-53

Cleaning your records electrostatically. In: Graf, Safe and Simple, p. 35

Dual tone decoder IC. Pop Elec, Dec. '73, pp. 81-82

8-track electronic timer simplifies recording. Pop Elec, July '79, pp. 57-63

Electronic vocal zapper cancels center channel of a stereo record and lets you substitute your own voice. Pop Elec, May '81, pp. 78-81

SOUND - RECORDING AND REPRODUCING (continued)

Headset/loudspeaker converter allows you loudspeaker volume on a set designed for headset reception. In: Mendelson, 103 Simple, p. 108

Lamp-readout VU meter to simplify audio recording. Pop Elec, Jan. '74, pp. 44-45

Magnetic headset booster. In: Mendelson, 103 Simple, p. 79

Making a simple sound reproducer and amplifier with a pin and either a piece of writing paper or a plastic container -- can be used to demonstrate reproducing sound using an old record. In: Penrose, Dr. Zed's Brilliant, pp. 44-45

Records - information on how a record is produced. In: Clarke, Encyclopedia of How It's Made, pp. 157-160

Stereo-balance meter. In: Mendelson, 103 Simple, p. 49

VU meter - enables watch to be kept on audio recording levels. In: Mendelson, 103 Simple, p. 105

VU meter with no moving parts. Pop Elec, Feb. '75, pp. 40-41

SOUND - TRANSMISSION

Communicate over light beams with the first single-LED transceiver. Pop Elec, Mar. '74, pp. 66-70

Does sound travel in a vacuum? In: Nelson, Science, p. 99

Does sound travel through solids? In: Nelson, Science, p. 97

Experiments to show that solids can transmit sound, and that sound can be transmitted through water. In: Rosenfeld, Science, pp. 104-106, 111-113, 115, 169

How does a stethoscope work? Constructing a simple stethoscope. In: Nelson, Science, p. 98

How does sound travel? Demonstration with two tin cans and a string. In: Nelson, Science, p. 96

Series of experiments demonstrating whether sound can travel through a vacuum. In: Rosenfeld, Science, pp. 108-109, 113-115, 169

Transmitting sound on a beam of light. Sci Am, Jan. '73, pp. 118-119, 128

Voice and TV picture transmission over a laser beam. In: Kallard, Exploring, pp. 73-75

SOUND EFFECTS

Bomb-burst synthesizer circuit. Pop Elec, Feb. '82, p. 109

Electronic sound effects machine (Audio artist). Pop Elec, Dec. '79, pp. 60-62, and corrections Mar. '80, p. 6 and Apr. '80, p.7

Experimenting with a sound-effects generator. Pop Elec, May '80, pp. 77-82, and correction July '80, p. 6, and addition Aug. '80, p. 6

Sound-effects generator. Pop Elec, Jan. '82, p. 90

Versatile sound effects generator. Pop Elec, Feb. '81, pp. 65+

SOUND WAVES

See also ULTRASONIC WAVES

Demonstration of transmission of energy by sound waves. Sci Teach, Oct. '75, p. 41

Echoes - sound wave demonstrations and experiments. In: Richards, Science Magic, p. 43

Holograms with sound and radio waves; sound and radio waves recorded on film by a precooling process. In: Light and Its Uses, pp. 57-61 (also in "Amateur Scientist" column, Sci Am, Nov. '72)

How sound waves are propagated. In: Cherrier, Fascinating...Physics, pp. 78-79

Music for the eyes - making sound waves visible. In: Cherrier, Fascinating...Physics, pp. 80-81

Seeing sound vibrations. In: Goldstein-Jackson, Experiments, pp. 100-101

SPACE BIOLOGY

SPACE BIOLOGY
See also LIFE ON OTHER PLANETS

Constructing a closed system using a water plant such as elodea, water, and two or three pond snails - simulating a closed system in space travel. In: Simon, How to Be a Space Scientist, pp. 56-57
Experiments to demonstrate the need for and function of a space suit in outer space -- demonstrations involving gases dissolved in liquids, the boiling point of water at reduced pressure, insulation against heat, etc. In: Rosenfeld, Science, pp. 91-99, 169

SPACE FLIGHT
See also ROCKETS (AERONAUTICS)

Can chlorella (a form of algae) be a source of oxygen in space travel? In: Greenleaf, Experiments in Space Science, p. 112
Demonstrations of friction and the importance of friction to space vehicles passing through the atmosphere. In: Simon, How to Be a Space Scientist, pp. 25-26
Experimenting with a simple accelerometer. In: Simon, How to Be a Space Scientist, pp. 39-40
How to gain weight in space: simple spinning bucket experiment demonstrating centrifugal force and relating it to space flight activities. In: Simon, How to Be a Space Scientist, pp. 36-37
How to lose weight in space: simple experiment demonstrating weightlessness using a rubber band and a lead weight in a wide-mouthed jar. In: Simon, How to Be a Space Scientist, pp. 33-34
How to make "space bread" from algae flour. In: Greenleaf, Experiments in Space Science, p. 113
Simple rubber band experiment demonstrating g-forces acting on an astronaut. In: Simon, How to Be a Space Scientist, pp. 30-31
Simulation of a heat shield on a space vehicle using test tubes or nursing bottles coated with candle wax. In: Simon, How to Be a Space Scientist, pp. 28-29
Using a toy top or gyroscope to demonstrate dealing with some of the problems of space flight. In: Simon, How to Be a Space Scientist, pp. 22-23

SPACE SCIENCES
See also, e.g., ASTRONOMY; ROCKETS (AERONAUTICS); SPACE BIOLOGY; SPACE FLIGHT; and other related headings

Rosenfeld, Science Experiments for the Space Age
Simon, How to Be a Space Scientist in Your Own Home

SPATIAL FILTERING (PHYSICS)
Simple optical experiments in which spatial filtering removes the "noise" from pictures; process using laser light is based on diffraction and interference of light waves. Sci Am, Nov. '82, pp. 194, 198, 198B, 199, 202-204, 204B-206
Spatial filtering experiments, using laser light. In: Kallard, Exploring, pp. 218-220

SPECTROGRAPH
See also SPECTROHELIOGRAPH; SPECTROHELIOSCOPE; SPECTROPHOTOMETER; SPECTROSCOPE

Diffraction-grating spectrograph. In: Light and Its Uses, pp. 96-101 (also in "Amateur Scientist" column, Sci Am, Sept. '56)

SPECTROGRAPH (continued)

Diffraction-grating spectrograph to observe auroras. In: Light and Its Uses, pp. 102-105 (also in "Amateur Scientist" column, Sci Am, Jan. '61)

Inexpensive diffraction-grating spectrograph. In: Light and Its Uses, pp. 106-111 (also in "Amateur Scientist" column, Sci Am, Sept. '66, with "Note on the Grating" in Sci Am, Nov. '66)

Ultraviolet spectrograph, with quartz prism. In: Light and Its Uses, pp. 112-117 (also in "Amateur Scientist" column, Sci Am, Oct. '68)

SPECTROHELIOGRAPH

See also SPECTROHELIOSCOPE

Spectroheliograph, to observe details on the disk of the sun. In: Light and Its Uses, pp. 131-135 (also in "Amateur Scientist" column, Sci Am, Apr. '58)

SPECTROHELIOSCOPE

See also SPECTROHELIOGRAPH

New kind of spectrohelioscope for observing solar prominences. Sci Am, Mar. '74, pp. 110-115, 124 (also In: Light and Its Uses, pp. 136-141)

SPECTROPHOTOMETER

See also SPECTROGRAPH; SPECTROPHOTOMETRY; SPECTROSCOPE

Homemade spectrophotometer scans the spectrum in a thirtieth of a second. Sci Am, Jan. '80, pp. 150, 155-160, 162

Inexpensive spectrophotometer; a photocell to measure the intensity of color transmitted by a liquid. In: Light and Its Uses, pp. 118-123 (also in "Amateur Scientist" column, Sci Am, May '68)

Recording spectrophotometer, built by a high school student. In: Light and Its Uses, pp. 124-130 (also in "Amateur Scientist" column, Sci Am, Jan. '75)

SPECTROPHOTOMETRY

See also, e.g., COLORIMETRY; FLAME PHOTOMETRY; GRAVIMETRIC ANALYSIS (CHEMISTRY); SPECTROPHOTOMETER; VOLUMETRIC ANALYSIS (CHEMISTRY); and other specific chemical analytical methods

Determination of iron in water by spectrophotometry. In: Skoog, Fundamentals, pp. 761-763 and other pages as indicated in text

Determination of manganese in steel using a spectrophotometer. In: Skoog, Fundamentals, pp. 763-764

Spectrophotometric investigation of a two-color system. In: Skoog, Fundamentals, pp. 547 and 764

SPECTROSCOPE

See also SPECTROGRAPH; SPECTROHELIOGRAPH; SPECTROHELIOSCOPE; SPECTROPHOTOMETER

Bunsen spectroscope; reconstructing the spectroscope that initiated modern spectroscopy. In: Light and Its Uses, pp. 92-95 (also in "Amateur Scientist" column, Sci Am, June '55, with "Note on Making Liquid Prisms" in Sci Am, Apr. '56)

Cigar box spectroscope. Sci Teach, Oct. '83, pp. 62-63

SPECTROSCOPE

SPECTROSCOPE (continued)

Hearing is believing - a modified spectroscope for blind students. Sci Teach, Apr. '83, pp. 53-55

How to build and use a simple spectroscope. In: Greenleaf, Experiments in Space Science, p. 131

Making and experimenting with a spectroscope which uses a diffraction grating. In: Wels, Science, pp. 64-66

Newfangled, recycled spectroscope using a cylindrical cardboard canister. Sci Teach, Sept. '78, p. 42

Ocular spectroscope; a telescope spectroscope that separates colors in starlight. In: Light and Its Uses, pp. 90-91 (also in "Amateur Scientist" column, Sci Am, Dec. '52)

Simple spectroscope. Sci Teach, Jan. '75, p. 54

SPECTRUM (LIGHT) AND SPECTRUM ANALYSIS

See also FLAME PHOTOMETRY; LIGHT; RAINBOW; and the headings for the various devices beginning with SPECTRO

Are all kinds of light rays the same? Demonstration uses a prism to produce a spectrum of colors from sunlight. In: Nelson, Science, p. 81

Demonstration showing spectrum formation from candle or alcohol lamp light passing through a diffraction grating; color effect of adding some common salts (table salt, epsom salts, baking powder) to the flame. In: Simon, How to Be a Space Scientist, pp. 67-68

"Light breaker" -- producing a solar spectrum with a mirror in water. In: Penrose, Dr. Zed's Brilliant, pp. 40-41

Making a solar spectrum using a mirror in water. In: Tuey, How to Be, pp. 22-23

Making rainbows from sunlight. In: Richards, Science Magic, pp. 30-31

Measuring the solar radiation spectrum; to examine some spectral characteristics of solar radiation. In: Norton, Solar Energy, pp. 27-28

Observing triboluminescence in hard candy and other substances and studying the spectrum produced. Sci Am, July '82, pp. 146-147, 150-151, 154

Ways of producing a rainbow. In: Cherrier, Fascinating...Physics, p. 75

SPECTRUM ANALYSIS

See SPECTRUM (LIGHT) AND SPECTRUM ANALYSIS

SPEECH

See also LANGUAGE AND LANGUAGES; VOICE

Sideband scrambler - can be used in sideband transmitter-receiver or telephone speech scrambler. In: Friedman, 99 Practical, p. 60

Speech board makes anything talk - synthesizer as a stand-alone device or with virtually any computer. Computers & Electronics, Dec. '82, pp. 47-48, 55-62

Speech synthesizer you can build for use with an S-100 bus computer. Pop Elec, Sept. '82, pp. 20+, and Oct. '82, pp. 43+

Speechlab: hobbyist vocal interface for a computer. Pop Elec, May '77, pp. 43-50

SPEED

See also SPEEDOMETERS; TACHOMETER

Build "cruisealert", a 55mph speed-limit alarm. Pop Elec, Feb. '79, pp. 57-60 and comment July '79, p. 6

Interferometer to measure velocity; a laser interferometer that converts a velocity to a sound signal. In: Light and Its Uses, p. 81 (also in "Amateur Scientist" column, Sci Am, Dec. '65)

SPEED (continued)
Laser Doppler velocimetry. In: Kallard, Exploring, pp. 176-179
Physics with flashers - a good, cheap, accurate, easy-to-use flashing light source and its use in physics experiments involving pendulums, acceleration, and velocity. Sci Teach, Sept. '83, pp. 42-44, 49

SPEED OF LIGHT
See LIGHT - SPEED

SPEEDOMETERS
Build a digital bicycle speedometer. Pop Elec, Mar. '77, pp. 39-41, and corrections July '77, pp. 6 and 7, and addition Aug. '77, p. 6
Build a digital speedometer for a car. Pop Elec, Sept. '76, pp. 42-45, and corrections and additions Dec. '76, p. 8

SPHERE
Spheres and hyperspheres - mathematical recreations. In: Gardner, Mathematical Circus, pp. 30-44

SPIDER WEBS
Capture spider webs. In: Brown, 666 Science Tricks & Expts., p. 149
Caught in the intrigue of spider orb-webs. Sci Teach, Jan. '77, pp. 16-19

SPIDERS
See also SPIDER WEBS

Garden spider and grass spider egg cases - how to find egg sacs, and what you can observe. In: Stokes, Guide, pp. 357-361

SPINNING MOTION
See ROTATIONAL MOTION

SPIRALS
Forming spirograms using laser light. In: Kallard, Exploring, pp. 46-48

SPIROMETER
See LUNGS

SPITTLEBUG (INSECT)
Spittlebugs - classification, life cycle, how to find, and what you can observe. In: Stokes, Guide, pp. 27-31

SPLICES
See KNOTS AND SPLICES

SPONTANEOUS COMBUSTION
See COMBUSTION, SPONTANEOUS

SPRINGTAIL (INSECT)
See SNOWFLEA (INSECT)

SQUARE
Benson, New Recreations with Magic Squares
Magic square - trick using graph paper. In: Shalit, Science, pp. 25-29
Magic squares - rows add up to same number. In: Shalit, Science, pp. 13-15
Mrs. Perkin's quilt and other square-packing problems. In: Gardner, Mathematical Carnival, pp. 139-149

SQUARE-WAVE GENERATOR
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STARCH
Chemical color reaction: iodine clock reaction - deep blue starch-iodine complex formed. In: Chen, Entertaining, pp. 25-27
Chemical color reaction: reversible color change accompanying temperature change, using iodine-starch solution. In: Chen, Entertaining, p. 37
Chemistry in the toaster -- toast tested for starch with iodine; untoasted part gives starch test, toasted part doesn't. In: Brown, 666 Science Tricks & Expts., p. 364
Chemist's test for starch. In: Morgan, First Chemistry Book, pp. 90-93
Chlorophyll is needed by green leaves for making starch -- how to show the presence of starch in leaves. In: Baldini, Student Science Activities, pp. 144-146
How do we digest carbohydrates (starches and sugars)? In: Nelson, Science, p. 305
How to detect the starch in rice; how to use the iodine test for starch in other foods. In: Morgan, First Chemistry Book, pp. 93-95
Starch iodine color mystery. In: Brown, 666 Science Tricks & Expts., pp. 352-353
Starch-iodine trick: water with a few drops of iodine turns blue when stirred with finger that has been dipped in cornstarch solution. In: Brown, 666 Science Tricks & Expts., p. 92
Starchy crackers - iodine test for starch, and effect of saliva on starch. In: Brown, 666 Science Tricks & Expts., p. 138
Testing food for starch using iodine. In: Baldini, Student Science Activities, p. 115
Testing for leaf starch using the iodine test. In: Stein, Science Book, p. 220
Testing for vitamin C using the vitamin's ability to destroy the blue color of iodine-starch complex. In: Brown, 666 Science Tricks & Expts., pp. 329-330
What foods contain carbohydrates (starches and sugars)? Tests with iodine solution and Benedict's solution. In: Nelson, Science, p. 304

STARFISHES
Starfish, as pets in a jar. In: Simon, Pets, pp. 86-89, 90-91

STARS
See also CONSTELLATIONS; SUN

Alphabetical list of bright stars, giving constellation, location and season indicators; sky charts. In: Wels, Science, pp. 144-145, 148-150
The brightest visible stars - a list of the 25 brightest stars, their astronomical and common names, distance, and apparent visual magnitude. In: Rosenfeld, Science, p. 178
Cereal-box planetarium. In: Herbert, Mr. Wizard's, p. 12
Heat a piece of iron or steel wire over a gas burner in a darkened room to show successive color changes as temperature increases - analogy to various colors of star light. In: Simon, How to Be a Space Scientist, p. 65
How bright is a star? Experiments with candles and light bulbs to investigate light intensity and its variation with distance, and the applicability to the study of stars. In: Rosenfeld, Science, pp. 149-157, 171
How far is a star? In: Rosenfeld, Science, pp. 139-147, 170

STARS (continued)
How to blaze star trails with a camera and how to find the center of the trails. In: Greenleaf, Experiments in Space Science, p. 34
How to find the bright stars of spring. In: Greenleaf, Experiments in Space Science, p. 36
How to make a sky clock and tell time by consulting the Big Dipper. In: Greenleaf, Experiments in Space Science, pp. 27-33
The observation of star occultations. In: Roth, Astronomy: A Handbook pp. 313-322
Photographing star clusters and nebulae. In: Mayall, Skyshooting, pp. 77-84
Photographing stars. In: Mayall, Skyshooting, pp. 41-59
Photographing stars to produce star trails. In: Mayall, Skyshooting, pp. 11-24
Photographing the stars with a Polaroid camera. Sci Teach, Sept. '74, p. 48
Photographing variable stars, novae and comets. In: Mayall, Skyshooting, pp. 60-76
Photometry of stars and planets. In: Roth, Astronomy: A Handbook, pp. 439-471

STATIC ELECTRICITY
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STATISTICS
See also PROBABILITIES

Dealing with uncertainties in experimental measurements (many examples given). In: Zebrowski, Fundamentals of Physical Measurement, pp. 25-45
Statistics. In: Bragg, Principles of Experimentation and Measurement, pp. 32-71

STEAM
Drops of water dance on a hot skillet; small pieces of heated metal dance on water; experimenter walks on hot coals - Leidenfrost effect. Sci Am, Aug. '77, pp. 126-131, 140
Making water beads in a hot frying pan, and why the process works. In: Herbert, Mr. Wizard's, p. 62
Water droplets can be made to dance in a hot pan - steam holds them up briefly. In: Brown, 666 Science Tricks & Expts., pp. 283-284

STEAM TURBINES
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STEEL
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Determination of manganese in steel using a spectrophotometer. In: Skoog, Fundamentals, pp. 763-764
Gravimetric determination of nickel in steel. In: Skoog, Fundamentals, p. 725
Heat a piece of iron or steel wire over a gas burner in a darkened room to show successive color changes as temperature increases - analogy to various colors of star light. In: Simon, How to Be a Space Scientist, p. 65
Make ink, using steel wool, vinegar, and tea. In: Brown, 666 Science Tricks & Expts., pp. 347-348
Oxidation demonstrated through rusting of steel wool. In: Baldini, Student Science Activities, pp. 96-97

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STEEL (continued)
Rust - demonstration of oxygen consumption in rusting of steel wool. In: Tuey, How to Be, pp. 10-11

STEEL - CORROSION
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STEREOCHEMISTRY
See also MOLECULES - MODELS; OPTICAL ROTATION

Geometric forms in chemistry. Sci Teach, Sept. '81, pp. 26-31

STEREOPHONIC SOUND SYSTEMS
See also HEADPHONES; LOUDSPEAKERS; PHONOGRAPH; SOUND - RECORDING AND REPRODUCING; TAPE RECORDERS - APPARATUS AND APPLIANCES

Build a dynamic audio noise filter -- ideal add-on device for stereo hi-fi systems. Pop Elec, Apr. '79, pp. 51-55
Build a speaker protection system - puts upper limit on decibel level sound system can generate. Pop Elec, Aug. '79, p. 54
Build a stereo blend control. Pop Elec, Feb. '78, pp. 55-57
Build a stereo roto-blender -- blend or transpose the two channels. Pop Elec, Oct. '78, pp. 66-68
Stereo amplifier balancer to provide volume and tone control balance. In: Friedman, 99 Practical, pp. 102-103
Stereo-balance meter. In: Mendelson, 103 Simple, p. 49
Stereo balancer. In: Carr, 104 Weekend, pp. 233-234
Synthesizer produces stereo sound from mono output of any TV receiver or VCR. Pop Elec, June '82, pp. 55-59
Wireless audio system for remote speakers. Pop Elec, Jan. '76, pp. 35-40, and correction Mar. '76, p. 6

STEREOSCOPE
Stereoscope making and stereoscopic photography. Sci Am, Dec. '78, pp. 184-186, 188, and further comments June '79, pp. 195, 198

STEREOSCOPIC PHOTOGRAPHY
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STEREOSCOPIC VIEWS
Stereoscopic theory and suggested experiment. Sci Am, Apr. '82, pp. 158, 160-161

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See also MEDICAL INSTRUMENTS AND APPARATUS

Funnel stethoscope. In: Herbert, Mr. Wizard's, p. 59
Heartbeats through a loudspeaker. In: Brown, 666 Science Tricks & Expts., pp. 29-30
How does a stethoscope work? Constructing a simple stethoscope. In: Nelson, Science, p. 98
Listen to your heart with Doppler ultrasound - ultrasonic stethoscope. Pop Elec, Aug. '75, pp. 60-63
Searching for sounds -- making a simple stethoscope. In: Richards, Science Magic, p. 42
Sensitive drawer knob stethoscope. In: Penrose, Dr. Zed's Dazzling, pp.38-39
Stethoscope. In: Clarke, Encyclopedia of How It Works, p. 199

STIBNITE
Determination of antimony in stibnite using iodine solution titration. In: Skoog, Fundamentals, pp. 362, 747-748

STOICHIOMETRY
Three simple stoichiometric experiments: determination of the atomic mass of an element (lithium), determination of the empirical formula of a compound (calcium chloride), and determination of the coefficients of an equation. Sci Teach, May '74, pp. 51-53

STORMS
See also THUNDERSTORMS

Early warning electronic storm detector. Pop Elec, Sept. '73, pp. 31-34, and revised version, Aug. '74, pp. 94-95
Storm forecasting electronic circuit. Pop Elec, Apr. '75, pp. 68-69

STRAINS AND STRESSES
See also STRENGTH OF MATERIALS

Experiment in stress analysis using plastic objects and polarizing filters. Sci Am, June '83, pp. 146-152, 154
Experiment to demonstrate effect of acceleration in falling; demonstration related to falling chimney phenomenon. Sci Am, Feb. '79, pp. 158, 160, 162, 168, and additional discussion Nov. '79, pp. 200, 202, 204
Experiment with forces causing a pencil point to break. Sci Am, Feb. '79, pp. 162-164, 168
Viewing stresses in plastic materials. Sci Teach, Mar. '83, p. 66

STRENGTH OF MATERIALS
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Demonstrating the strength of an eggshell. In: Goldstein-Jackson, Experiments, pp. 86-87
Demonstrations of the strength of paper. In: Richards, Science Magic, p. 17
The difficult feat of crushing an egg in your hand. In: Herbert, Mr. Wizard's, p. 40
Egg drops; from how high can you drop an egg without breaking it? - altering the carton containing the egg; altering the egg size, weight, etc.; changing shock absorbers, etc. In: Renner, How to Build, pp. 52-76
How strong is paper? Sci Teach, Mar. '82, pp. 64-65
The I-beam idea -- demonstration of relative bending of a yardstick when supporting weight on its side and on its edge. In: Brown, 666 Science Tricks & Expts., p. 392
Strength of straw. In: Lanners, Secrets, pp. 48-49
Tensile strength and ductility tester and its use. In: Giant Handbook, pp. 227-231
Tensile strength tester and its use - useful particularly for radio hobbyist testing strength of wire antennas. In: Giant Handbook, pp. 225-228
Testing supportive strength of cardboard by constructing different bridge models. In: Brown, 666 Science Tricks & Expts., pp. 384-386

STRESS (MECHANICS)
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STROBOSCOPE

STROBOSCOPE

Build the poor man's strobe - allows timed, sequential flashes for multiple photographic exposures of moving subjects. Pop Elec, June '81, pp. 63-67

Calibrate a stroboscope accurately. Sci Teach, Apr. '73, p. 47

Cheap reflector to brighten a strobe, and schematic of the strobe unit. In: Giant Handbook, pp. 274-277

Demonstration using a stroboscope shows how a tuning fork vibrates. Sci Teach, Apr. '74, p. 46, and comment Mar. '78, pp. 35-36

Demonstrations of stroboscopic effects. In: Brown, 666 Science Tricks & Expts., pp. 303-305, 308

Experimenting with electronic flash circuits, including a xenon strobe flasher circuit. Computers & Electronics, May '83, pp. 90-92, and correction Oct. '83, p. 106

Flash tubes: operation and applications. Pop Elec, Jan. '73, pp. 68-70

Improved stroboscope. In: Cherrier, Fascinating...Physics, pp. 71, 73-74

Laser stroboscope. In: Kallard, Exploring, pp. 72-73

Light-activated slave strobe trigger. Pop Elec, June '73, p. 40

Strobe flasher for night cycling. Pop Elec, Oct. '76, pp. 68-70

Stroboscopic lighting device. In: Cherrier, Fascinating...Physics, p.73

Stroboscopy; seeing phenomena invisible to the naked eye. In: Cherrier, Fascinating...Physics, pp. 69-72

Whirling wonder discs. In: Wels, Science, pp. 2-7

SUBLIMATION (CHEMISTRY)

Substances that sublime: mothballs. In: Brown, 666 Science Tricks & Expts., p. 368

SUBMARINE BOATS

Submarine -- how does it work. In: Papallo, What Makes It Work, pp. 84-85

A working model submarine. In: Richards, Science Magic, p. 14

SUCCULENT PLANTS

Indoor gardening projects: cacti and other succulents; iceplant, Indian corncob. In: Millard, Plants for Kids, pp. 94-99

SUCTION

What is suction? Demonstration with two plungers. In: Nelson, Science, p. 28

SUGARS

Electrolytes - demonstration with sugar and salt solutions. In: Brown, 666 Science Tricks & Expts., pp. 348-349

Grow your own crystals with salt, sugar or washing soda. In: Amery, KnowHow...Experiments, p. 8

Growing crystals from a sugar solution. Sci Teach, May '82, p. 61

How can we separate a mixture of sugar and sand? In: Nelson, Science, p.9

How do we digest carbohydrates (starches and sugars)? In: Nelson, Science, p. 305

Large sugar crystals called rock candy can be made in kitchen laboratory. In: Morgan, First Chemistry Book, pp. 41-44

"Magic" powder that swells up and turns black - a chemical reaction involving cobalt chloride, sulphur and sugar. In: Cherrier, Fascinating... Chemistry, p. 61

Making a sugar cube burn using ashes. In: Shalit, Science, pp. 38-39

Simple chemical change - sugar heated in an old spoon becomes a black charred mass of carbon. In: Brown, 666 Science Tricks & Expts., p. 357

SUGARS (continued)
Sugar crystals. In: Cherrier, Fascinating...Chemistry, p. 31
Sugar refining. In: Clarke, Encyclopedia of How It's Made, pp. 176-178
Sugar that flames - sugar cube burns when ash catalyst added. In: Cherrier, Fascinating...Chemistry, p. 70
Testing food for sugar. In: Baldini, Student Science Activities, p. 116
What foods contain carbohydrates (starches and sugars)? Tests with iodine solution and Benedict's solution. In: Nelson, Science, p. 304
What is meant by a chemical change? Demonstration involves heating sugar over a flame or other heat source. In: Nelson, Science, p. 11

SULFUR
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SULFUR DIOXIDE
See SULPHUR DIOXIDE

SULPHATES
See also MAGNESIUM SULPHATE

Amperometric titrations: titration of lead and titration of sulfate ion, using dropping mercury electrode. In: Skoog, Fundamentals, pp. 760-761 and chapter 21
Gravimetric analysis of a soluble sulfate based upon precipitation with barium ion. In: Skoog, Fundamentals, pp. 720-721
One crystal inside another, using potassium alum and chrome alum or nickel sulphate and magnesium sulphate. In: Cherrier, Fascinating... Chemistry, p. 29

SULPHUR
Burning powdered sulfur in a jar of oxygen. In: Morgan, Adventures in Electrochemistry, p. 216
Chemical color reaction: clock reaction based on the formation of colloidal sulfur. In: Chen, Entertaining, pp. 34-35
Hot iron coated with powdered sulfur is inserted into a jar of oxygen - reddish-brown iron (ferric) oxide is produced. In: Morgan, Adventures in Electrochemistry, pp. 216-217
How to make a compound, demonstrating principles that mixing does not lead necessarily to chemical combination and that heating can lead to compound formation - reaction of iron and sulfur. In: Baldini, Student Science Activities, pp. 104-105
"Magic" powder that swells up and turns black - a chemical reaction involving cobalt chloride, sulphur and sugar. In: Cherrier, Fascinating... Chemistry, p. 61
Physical change of sulfur - observe the several changes sulfur undergoes as it is slowly heated. In: Brown, 666 Science Tricks & Expts., pp. 356-357
Small amount of a mixture of potassium chlorate and sulfur produces a loud bang when hit by a hammer. In: Chen, Entertaining, p. 66
Sulfur in eggs and mustard will tarnish silver, but will not affect a stainless steel spoon. In: Brown, 666 Science Tricks & Expts., p. 356
Turning a red rose white by bleaching with sulphur dioxide. In: Goldstein-Jackson, Experiments, pp. 116-117
Why sulfur thickens when heated. Sci Teach, Apr. '81, pp. 23-24

SULPHUR DIOXIDE

SULPHUR DIOXIDE
Air pollution experiment - the effect of sulphur dioxide on plant life. Sci Teach, Jan. '73, pp. 38-39
Burning powdered sulfur in a jar of oxygen. In: Morgan, Adventures in Electrochemistry, p. 216
Pollution to order: sulfur dioxide from photographer's hypo and lemon juice. In: Brown, 666 Science Tricks & Expts., p. 343
Sulfur dioxide from photographer's hypo and lemon juice. In: Brown, 666 Science Tricks & Expts., p. 363
Turning a red rose white by bleaching with sulphur dioxide. In: Goldstein-Jackson, Experiments, pp. 116-117
Two bleaches - sodium hypochlorite and sulfur dioxide. In: Brown, 666 Science Tricks & Expts., pp. 360-361

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Determining the altitude and azimuth of the sun. In: Norton, Solar Energy, pp. 1-8
How to build a gnomon and how to use it to find the sun's altitude at various times of the year. In: Greenleaf, Experiments in Space Science, pp. 88-91
How to examine the sun safely and use other sources to determine sunspot activity. Pop Elec, Nov. '76, pp. 34-38, and correction July '77, pp. 6-7
How to find the diameter of the sun. In: Greenleaf, Experiments in Space Science, pp. 76-77
How to find the earth's distance from the sun (all measurements are given; this is a drawing exercise only). In: Greenleaf, Experiments in Space Science, p. 78
How to find the sun's altitude changes during the year and the inclination of the earth's axis (an experiment to be conducted on Dec. 22 and June 21). Experiment uses a homemade gnomon. In: Greenleaf, Experiments in Space Science, pp. 88, 94
How to find your latitude anywhere at any time during the year, using a homemade gnomon. In: Greenleaf, Experiments in Space Science, pp.88, 97
How to find your latitude at the time of the equinoxes, Sept. 23 and March 21, using a homemade gnomon. In: Greenleaf, Experiments in Space Science, pp. 88, 95
How to find your latitude at the time of the winter solstice, Dec. 22, and the summer solstice, June 21, using a homemade gnomon. In: Greenleaf, Experiments in Space Science, pp. 88, 95-96
Measuring the width (diameter) of the sun. In: Rosenfeld, Science, pp. 48-49, 52-53, 167
Method of viewing the sun safely, making use of binoculars. Sci Am, Nov. '74, p. 130
Photographing the sun. In: Mayall, Skyshooting, pp. 85-97
The sun -- observation, helioscope, projected solar images, sunspots, faculae, prominences, photography of the sun, etc. In: Roth, Astronomy: A Handbook, pp. 221-254
Sun tracking -- more daytime astronomy. Sci Teach, May '83, pp. 73-74

SUN - ECLIPSES
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SUN-SPOTS
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SUNDIALS
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Build an electronic solar-powered sundial. Pop Elec, Mar. '80, pp. 36, 38-40, 42-43, and additions May '80, p. 7 and June '80, p. 6
Easy-to-read sundial. Sci Am, Dec. '80, pp. 231-235, 238, 246, and correction May '81, p. 184
Home-made clocks: sundial, candle clock, sand clock. In: Richards, Science Magic, pp. 48-49
Making a sundial. In: Spooner, Sunpower, pp. 11-15
Modern sundials. In: Roth, Astronomy:A Handbook, pp. 191-203
Sundial from knitting needle, cork, and white cardboard. In: Tuey, How to Be, pp. 66-67
Sundials -- simple construction of two. In: Lanners, Secrets, pp. 116-117
Tell time by using the sun -- a rudimentary sun-dial. In: Nelson, Science, p. 156

SUNFLOWERS
Sunflowers. In: McPhee, Gardening, pp. [24-25]

SUNSET PHENOMENA
Red sunset and blue sky with a shoe box. Sci Teach, Feb. '74, p. 47
Why is a sunset red? Demonstration using a flashlight and some milk in water. In: Amery, KnowHow...Experiments, p. 21

SUNSPOTS
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How to examine the sun safely and use other sources to determine sunspot activity. Pop Elec, Nov. '76, pp. 34-38, and correction July '77, pp. 6-7
Observing and measuring the width (diameter) of sun-spots. In: Rosenfeld, Science, pp. 48, 50-53, 167
Sunspots -- appearance, classification, apparent movement, period, distribution, etc. In: Roth, Astronomy: A Handbook, pp. 227-237

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SURFACE CHEMISTRY
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Surface chemistry in the atmosphere, investigated using a Langmuir trough. In; Schaefer, A Field Guide, pp. 316-318

SURFACE TENSION
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Attracting a matchstick with a lump of sugar. In: Goldstein-Jackson, Experiments, pp. 60-61
Beating mercury heart -- a surface tension effect. In: Chen, Entertaining, pp. 83-84
Blowing bubbles. In: Richards, Science Magic, p. 25
Demonstrating water surface tension with wine glasses. In: Goldstein-Jackson, Experiments, pp. 68-69
Demonstrations of surface tension. In: Brown, 666 Science Tricks & Expts., pp. 150-154, 156-158, 161-165, 173-174, 177, 179-180, 182-183, 186-187, 190-195

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SURFACE TENSION (continued)

Floating a "marble" of oil in a mixture of water and rubbing alcohol. In: Herbert, Mr. Wizard's, p. 30

Investigation of the formation of "tears" on the insides of glasses of wine and other alcoholic beverages. Sci Am, May '83, pp. 162-164, 170

Jar puzzle - jar containing water and the opening of which is covered with cheesecloth will hold the water in when the jar is turned upside down. In: Herbert, Mr. Wizard's, p. 34

"Magic harbor" surface tension demonstration. In: Shalit, Science, p.98

Making a speedboat from a match. In: Goldstein-Jackson, Experiments, pp. 62-63

Making bubbles last longer using glycerine. In: Goldstein-Jackson, Experiments, pp. 66-67

Making perfect ink circles without a compass. In: Goldstein-Jackson, Experiments, pp. 70-71

Making water wetter - a surface tension effect. In: Goldstein-Jackson, Experiments, pp. 118-119

Moving pepper with a bar of soap. In: Goldstein-Jackson, Experiments, pp. 64-65

Moving water with a handkerchief. In: Goldstein-Jackson, Experiments, pp. 72-73

The screen-that-holds-water trick. In: Penrose, Dr. Zed's Brilliant, pp. 54-55

Soap and detergents make water wetter. In: Morgan, First Chemistry Book, pp. 163-168

Soap circle: surface tension. In: Stein, Science Book, p. 167

Soap defogger demonstration shows action of surface tension. In: Herbert, Mr. Wizard's, p. 49

Soap tricks demonstrating surface tension. In: Herbert, Mr. Wizard's, p. 46

Sphere of oil, or the form taken by a liquid free to spread. In: Cherrier, Fascinating...Physics, p. 30

Surface tension study with a simple device. Sci Teach, Feb. '75, p. 52

Surface tension tricks. In: Penrose, Dr. Zed's Brilliant, pp. 50-51

Two demonstrations with corks floating in glasses of water and involving surface tension. In: Cobb, Bet You Can't, pp. 62-63

Water's invisible skin. In: Richards, Science Magic, p. 24

Watertight sieve. In: Richards, Science Magic, p. 26

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SWEET POTATOES

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Grow a sweet potato vine in water (without soil). In: Taylor, Kids' Whole Future Catalog, p. 65

How do we make a decorative house plant with a sweet potato? Growing a sweet potato in water. In: Nelson, Science, p. 239

Indoor gardening project: sweet potato vines. In: Millard, Plants for Kids, pp. 18-21

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SYMBIOSIS
Mutualism -- a laboratory exercise on termite protozoa and cellulose digestion. Sci Teach, Apr. '73, pp. 42-44

SYMBOLIC LOGIC
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TACHOMETER
Auto tachometer using Zener diode and transistor. In: Friedman, 99 Practical, pp. 24-25
Build a digital marine/auto tachometer. Pop Elec, June '75, pp. 40-42, and correction Aug. '75, p. 6, and comment Sept. '75, p. 6
Build a digital phototachometer - measures rotational speeds by optical coupling. Pop Elec, Mar. '78, pp. 47-51
Build an accurate dwell/tachometer instrument. Pop Elec, Apr. '73, pp. 67-71
IC photo tachometer. Pop Elec, Aug. '74, pp. 54-57, and correction Feb. '75, p. 6
IC tachometer. Pop Elec, Sept. '73, pp. 104-105
Remotely sensing tachometer using laser light. In: Kallard, Exploring p. 44
Wireless idle tachometer for auto tune-ups. Pop Elec, May '81, pp. 75-77

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TANNIC ACID
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TANNING
Tannic acid is used in making leather; demonstration of the effect of tannin upon gelatin. In: Morgan, First Chemistry Book, pp. 107-111

TANNINS
The acid which is in tea and coffee - detection with litmus paper. In: Morgan, First Chemistry Book, p. 107
Magic ink chemical trick using tannin, ferric chloride and oxalic acid. In: Shalit, Science, p. 47
Tannic acid is used in making leather; demonstration of the effect of tannin upon gelatin. In: Morgan, First Chemistry Book, pp. 107-111
Tannin is a useful acid; making ink with tea and a suitable iron compound. In: Morgan, First Chemistry Book, pp. 111-112

TAPE RECORDERS - APPARATUS AND APPLIANCES
Build a tape recorder/amplifier FET VU meter. Pop Elec, June '74, pp. 52-53
Cassette and cartridge. In: Clarke, Encyclopedia of How It Works, pp. 54-55
Low-cost power supply for car tape players. In: Giant Handbook, pp. 375-376
Tape recorder. In: Clarke, Encyclopedia of How It Works, pp. 200-203
Tape recorder sound switch. In: Giant Handbook, pp. 26-28
Versatile tape recorder control. Pop Elec, Oct. '73, pp. 44-46

TARNISH

Chemical trick involving removing copper tarnish with ketchup. In: Shalit, Science, pp. 45-47

Clean copper or brass. In: Brown, 666 Science Tricks & Expts., p. 314

Clean the silver using aluminum foil and bicarbonate of soda. In: Stein, Science Book, p. 220

Sulfur in eggs and mustard will tarnish silver, but will not affect a stainless steel spoon. In: Brown, 666 Science Tricks & Expts., p. 356

Using aluminum to remove silver tarnish. In: Herbert, Mr. Wizard's, p. 61

Why silverware tarnishes - demonstration of the effect of sulfur on silver; how to remove tarnish from bright finish silver and pewter. In: Morgan, First Chemistry Book, pp. 156-159

TASTE

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The artichoke phenomenon - the effect of artichokes on the tongue. In: Cobb, More Science Experiments, pp. 114-118

Mapping the tongue. Are certain areas of the tongue more sensitive to one taste than to another? In: Cobb, More Science Experiments, pp. 118-126

No clues: Coke versus 7-Up. If a person cannot see the color of the soda, can Coke and 7-Up be confused? In: Cobb, More Science Experiments, pp. 110-112

Smell without taste: artificial strawberry 'flavoring'. In: Cobb, More Science Experiments, pp. 105-106

Sweetening melons - investigating flavor potentiation. Effect of salt on sweetness. In: Cobb, More Science Experiments, pp. 112-114

Taste experiments; mapping the tongue; what skins can taste. In: Stein, Science Book, pp. 213-215

Taste without smell: apple versus potato versus onion. In: Cobb, More Science Experiments, pp. 106-109

Tasteless coffee - demonstration of how important smell is in our perception of foods. In: Brown, 666 Science Tricks & Expts., pp. 118-119

Tongue foolers - demonstrations with several liquid and solid foods. In: Brown, 666 Science Tricks & Expts., pp. 134-135

TEA

The acid which is in tea and coffee - detection with litmus paper. In: Morgan, First Chemistry Book, p. 107

Brewing solar tea. Sci Teach, Jan. '80, pp. 35-36

Make ink, using steel wool, vinegar, and tea. In: Brown, 666 Science Tricks & Expts., pp. 347-348

Tannic acid is used in making leather; demonstration of the effect of tannin upon gelatin. In: Morgan, First Chemistry Book, pp. 107-111

Tannin is a useful acid; making ink with tea and a suitable iron compound. In: Morgan, First Chemistry Book, pp. 111-112

Tea to a T: temperature for the "perfect" infusion - experiment to determine if temperature and boiling time of water have an effect on tea taste. In: Cobb, More Science Experiments, pp. 90-93

Wonders of physics that can be found in a cup of coffee or tea - fluid dynamics, electrostatics, pitch of sound, cooling. Sci Am, Nov. '77, pp. 152, 154-158, 160, 164

TEETH

Making a cast of your teeth. In: Stein, Science Book, pp. 117-118
Sweet tooth exposé - the Snyder test. Sci Teach, Feb. '82, pp. 30-31
What should we know about our teeth? Includes diagram of arrangement of types of teeth in the mouth and chart of ages of first and second eruptions and first shedding. In: Nelson, Science, pp. 300-301

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Four electromagnetic projects -- magnetization of metal objects, solenoid action, telegraph operation and relay switching. In: Giant Handbook, pp. 295-297
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How to make a mini-telegraph. In: Baldini, Student Science Activities, pp. 38-42
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Simple telegraph (Morse Code for letters and numbers included). In: Chapman, Young Scientist, pp. 26-27

TELEMETER

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TELEPATHY

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TELEPHONE

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Add a distinctive extension phone ring to your telephone. Pop Elec, Apr. '82, pp. 56+
Build a telephone status monitor - turns on an indicator lamp at extensions when a phone on the line is in use. Pop Elec, June '82, pp. 60-61, and comment in Computers & Electronics, Nov. '82, p. 6
Computerized automatic telephone dialer (continuation of a series, a previous part of which appeared in the Nov. '80 issue, pp. 61+). Pop Elec, Jan. '81, pp. 68-69, 74-76 and Feb. '81, pp. 79-82
Electronic ringer for telephone lines. Pop Elec, May '81, pp. 70-73, and addition Aug. '81, p. 7
Homemade telephone with paper cups and string. In: Brown, 666 Science Tricks & Expts., pp. 41-42
Interoffice phone amplifier. In: Mendelson, 103 Simple, p. 92
Melodic telephone ringer. Pop Elec, Nov. '81, pp. 57-59, and correction Feb. '82, p. 12
Plastic-glass phone. In: Herbert, Mr. Wizard's, p. 72
Sideband scrambler - can be used in sideband transmitter-receiver or telephone speech scrambler. In: Friedman, 99 Practical, p. 60
Super hold: a telephone peripheral allowing hold function on any touch-tone phone and having provisions for music during hold. Computers & Electronics, May '83, pp. 59-60, 62, 64-65, and correction July '83, p. 7
Telephone-activated light circuit for the handicapped. Pop Elec, Mar. '78, p. 86
Telephone amplifier. In: Mendelson, 103 Simple, p. 32
Telephone -- how it works. In: Papallo, What Makes It Work, p. 95
Telephone system. In: Clarke, Encyclopedia of How It Works, pp. 204-210

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Touchtone® dialer construction. In: Carr, 104 Weekend, pp. 227-228

Two telephone intercom systems. In: Giant Handbook, pp. 286-289

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General telescope observing hints, particularly for 3-inch reflector -- field of view, magnification, focusing, using a motorized clock drive, short focal length eyepieces, etc. In: Wels, Science, pp. 124-125, 139-140

Homemade telescope made specifically to be transported by trailer. Sci Am, July '75, pp. 121-124, 132

How a reflecting telescope works (illustration), and collimating a reflector. In: Wels, Science, p. 123

How to construct a simple refracting telescope. In: Greenleaf, Experiments in Space Science, p. 138

Introduction to radio astronomy, plus instructions for a simple telescope system. Pop Elec, Jan. '76, pp. 41-45, and addition May '76, p. 6

Magical topsy-turvy picture maker -- pinhole scope lens and zoom tube. In: Penrose, Dr. Zed's Dazzling, pp. 12-13

Telescope. In: Clarke, Encyclopedia of How It Works, pp. 211-212

Telescope - demonstration with two magnifying glasses shows principle of the refracting telescope. In: Brown, 666 Science Tricks & Expts., pp. 309-310

Telescope - how it works. In: Papallo, What Makes It Work, p. 113

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Construction of an elbow finder telescope. Sci Am, June '75, pp. 112, 114

General and simple discussion of eyepiece filters for astronomy. In: Wels, Science, pp. 151-152

General telescope observing hints, particularly for a 3-inch reflector -- field of view, magnification, focusing, using a motorized clock drive, short focal length eyepieces, etc. In: Wels, Science, pp. 124-125, 139-140

Heavy duty mount for larger telescopes. In: Wels, Science, pp. 135-136

Inexpensive device for indicating position of telescope uses a pocket calculator. Sci Am, Feb. '79, pp. 164-166

Ocular spectroscope -- a telescope spectroscope that separates colors in starlight. In: Light and Its Uses, pp. 90-91 (also in "Amateur Scientist" column, Sci Am, Dec. '52)

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Build a laser TV system using a helium-neon laser. Pop Elec, Nov. '74, pp. 32-38

Demonstrators of television operation - drawings, television parts, and wood constructions used to demonstrate operation. In: Giant Handbook, pp. 73-79

Illusions in the "snow": more fun with random dots on the television screen. Sci Am, May '80, pp. 176, 179-182, 184, 186

Television. In: Clarke, Encyclopedia of How It Works, pp. 213-221

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Build a high-gain rhombic TV antenna. Pop Elec, Oct. '75, pp. 58-60
Build all solid-state TV camera. Pop Elec, Feb. '75, pp. 27-31
Light-controlled latching switch - can be used for TV sound control, e.g. In: Friedman, 99 Practical, pp. 90-91
Low-cost convergence generator. Pop Elec, Aug. '73, pp. 61-67
Power guard -- boosts voltage and eliminates TV picture shrinkage during summer brownouts. Pop Elec, July '75, pp. 34-35
Remote-control TV commercial cutoff circuit. Pop Elec, May '76, p. 26
Synthesizer produces stereo sound from mono output of any TV receiver or VCR. Pop Elec, June '82, pp. 55-59
TV bugger transmits signal which can scramble reception. In: Giant Handbook, pp. 277-279
TV commercial killer. Pop Elec, July '73, p. 69
Television commercial killer circuit using the 555 timer IC. Pop Elec, Jan. '79, p. 80
Two-set antenna coupler -- this set-up electrically isolates the antenna connections of the two TV's. In: Friedman, 99 Practical, pp. 124-125
Wireless ad-zap turns off TV commercials - uses infrared beam. Pop Elec, Feb. '81, pp. 44-51

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Low-cost dot/bar generator -- inexpensive color-TV servicing instrument. Pop Elec, Sept. '78, pp. 78-79
Picturetube tester and rejuvenator. Pop Elec, Oct. '73, p. 50, and correction Mar. '74, pp. 8-9
Radio-TV signal tracer. In: Mendelson, 103 Simple, pp. 93-94

TEMPERATURE

See also, e.g., ATMOSPHERIC TEMPERATURE; BODY TEMPERATURE; BOILING POINTS; HEAT; MELTING POINTS; SOIL TEMPERATURE; THERMISTORS; THERMOMETERS AND THERMOMETRY; THERMOSCOPE; THERMOSTAT

Basic temperature-measuring circuit. In: Fox, Unique Electronic, pp. 7-8
Build a miniature environmental test chamber which can be set from 14°F to 158°F with 1-degree accuracy; can be used to test circuits at unusual temperatures. Pop Elec, Feb. '74, pp. 34-39
Effect of a converging lens on temperature; to measure temperature achieved by concentrating sun's direct rays with a converging lens. In: Norton, Solar Energy, pp. 29-30
Measuring air temperature; need for a thermometer shelter. In: Fox, Unique Electronic, pp. 23-24
Measuring temperature electronically, including instructions for constructing specific types of electronic thermometers. In: Fox, Unique Electronic, pp. 7-24
Novel temperature control system using PTC thermistors. Pop Elec, Jan. '73, p. 94

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TEMPERATURE CONVERSION

Understanding temperature conversion. Sci Teach, Mar. '79, pp. 41-42

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Bet you can't drop a penny held between two fingers - demonstration of the interdependence of fingers because of ligament connections. In: Cobb, Bet You Can't, p. 111

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TERMITES
Mutualism -- a laboratory exercise on termite protozoa and cellulose digestion. Sci Teach, Apr. '73, pp. 42-44
Termite soldiers - warriors with chemical weapons. Sci Teach, Mar. '82, pp. 50-53
The total termite: everything you need to know to invite these much maligned insects into your class. Sci Teach, Apr. '82, pp. 29-33

TERRARIUMS
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The groundwater terrarium: geology on a small scale. Sci Teach, May '82, pp. 44-46
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Jar terrarium. In: Herbert, Mr. Wizard's, p. 35
Jar terrariums - woodland, desert, school ground survey. In: Baldini, Student Science Activities, pp. 161-163
Making a terrarium. In: Nelson, Science, p. 242
No-dig, no-work bottle garden. In: Penrose, Dr. Zed's Dazzling, pp. 28-29
Preparation of glass containers for aquaria and terraria. Sci Teach, Nov. '74, pp. 48-49
Terrariums. In: Millard, Plants for Kids, pp. 100-111

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THEORETICAL CHEMISTRY
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Novel temperature control system using PTC thermistors. Pop Elec, Jan. '73, p. 94
Thermistor-based electronic thermometer. In: Carr, 104 Weekend, pp. 99-101
Thermistors as sensors; a basic thermistor thermometer. In: Fox, Unique Electronic, pp. 10-12

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Hilsch tube mystery. In: Brown, 666 Science Tricks & Expts., pp. 65-66
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Electricity from heat - demonstration using two wires of different metals and earphone. In: Brown, 666 Science Tricks & Expts., p. 234
Thermoelectric currents. In: Lanners, Secrets, pp. 94-95
Thermoelectric effect, and how a simple single-junction semiconductor thermoelectric device is constructed and energized. Computers & Electronics, July '83, pp. 86, 88, 90

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Thermoelectricity - producing electricity from heat. In: Graf, Safe and Simple, pp. 81-82

THERMOMETERS AND THERMOMETRY

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An air thermometer. In: Simon, Projects, pp. 18-19

Basic temperature-measuring circuit. In: Fox, Unique Electronic, pp. 7-8

Build a diode temperature probe, giving temperature readings on a digital multimeter. Pop Elec, Feb. '81, p. 62, and correction Mar. '82, p. 8

Build a solar controller - electronic temperature comparator for solar energy systems or attic fans. Pop Elec, July '77, pp. 69-70, and comment Oct. '77, p. 14

Build a 3 1/2-digit LCD digital thermometer. Pop Elec, May '80, pp. 55-59

Build the intelligent thermometer using a microprocessor and a programmed EPROM. Computers & Electronics, Jan. '83, pp. 74-81 and Feb. '83, pp. 95-98, 100-101

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CMOS integrated circuit battery-operated digital thermometer using a silicon resistor sensor. In: Fox, Unique Electronic, pp. 12-17

Cricket thermometer. In: Brown, 666 Science Tricks & Expts., p. 109

Differential thermometer. In: Carr, 104 Weekend, pp. 106-107

Digital clock and thermometer projects use sun or artificial light to recharge batteries. Pop Elec, Dec. '77, pp. 41-47

Dual transistor electronic thermometer. In: Carr, 104 Weekend, pp. 90-96

Effect of a converging lens on temperature; to measure temperature achieved by concentrating sun's direct rays with a converging lens. In: Norton, Solar Energy, pp. 29-30

Electronic A/D temperature converter. Pop Elec, Dec. '76, pp. 62-63, and correction June '77, p. 6

Electronic skin temperature thermometer -- suggested as useful in biofeedback activities. Pop Elec, Sept. '75, pp. 62-63

Electronic thermometer with IC sensor. In: Carr, 104 Weekend, pp. 96-98

Heat-sensitive transistor used as a thermometer. Pop Elec, Dec. '74, p. 68

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IC temperature-sensor thermometer. In: Carr, 104 Weekend, pp. 101-106

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Kiln temperature sensor. Pop Elec, Nov. '81, p. 80

Liquid crystal temperature detection device, using laser light. In: Kallard, Exploring, pp. 109-110

Low-cost electronic thermometer - local or remote temperatures from freezing to 302°F. Pop Elec, Jan. '73, p. 46

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Measurement of temperature and humidity with a sling psychrometer. In: Schaefer, A Field Guide, pp. 307-308

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Practical single-transistor thermometer. In: Fox, Unique Electronic, pp. 8-10

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Schematic of an inexpensive thermal thermometer easily assembled by students. Sci Teach, Sept. '79, p. 28
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Versatile digital LED thermometer. Pop Elec, Nov. '74, pp. 54-56
What is the difference between a Centigrade (Celsius) and a Fahrenheit thermometer? In: Nelson, Science, p. 63

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Tin can differential thermoscope. Sci Teach, Jan. '82, pp. 56-57

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Old refrigerator aquarium thermostat. Sci Teach, Feb. '75, p. 62
Solid-state thermostat. Pop Elec, Jan. '77, pp. 73-74, and correction Mar. '77, p. 6
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Thermostat device - construction and use; provides example of differential coefficient of expansion of two metals. Sci Teach, Oct. '74, pp. 38-40
Thermostat with a brain -- automatically alters temperature setting. In: Fox, Unique Electronic, pp. 97-99
Thermostatics: proven energy savings -- simulated house heating to demonstrate thermostat setback savings. Sci Teach, May '83, pp. 70-71

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Measuring the diameter of a hair by diffraction using laser light. In: Kallard, Exploring, pp. 202-203
Thickness measurement by interference, using laser light. In: Kallard, Exploring, pp. 129-132

THIN FILMS
Bright colors in soap film are a lesson in wave interference. Sci Am, Sept. '78, pp. 232-236, 240, 242
Method of laying a thin film on a surface having a higher refractive index than the film; colors in thin films. Sci Am, June '79, pp. 198-200, 202
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Photochemical reduction of thionin. In: Chen, Entertaining, pp. 57-58

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Reversible photochemical changes involving thiourea. In: Chen, Entertaining, p. 59

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Detecting thunderstorms with your transistor radio. In: Fox, Unique Electronic, pp. 109-110
Electronic thunderstorm/tornado detector and tornado alerter. In: Fox, Unique Electronic, pp. 110, 112-113, 116-117
How far the storm? Instructions for estimating the distance of a thunder-storm. In: Brown, 666 Science Tricks & Expts., p. 15
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Thyratron motor control panel. In: Giant Handbook, pp. 341-344

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Tide study. Sci Teach, Nov. '73, p. 44
What causes tides? Demonstration using a rubber band and models of the earth, moon, and sun. In: Nelson, Science, p. 158

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The tiltmeter: 'earth-shaking' device for simulating volcanism. Sci Teach, Mar. '81, pp. 42-43, and correction and comments May '81, p. 21

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How to make a sky clock and tell time by consulting the Big Dipper. In: Greenleaf, Experiments in Space Science, pp. 27-33
How to measure the siderial month using a homemade transit instrument. In: Greenleaf, Experiments in Space Science, pp. 18-20, 55
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How to tell time with a compass. In: Graf, Safe and Simple, p. 65
Pendulum as a time device. In: Baldini, Student Science Activities, pp. 52-54

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Fly and worm farms -- how to raise fruit flies and meal worms to feed terrarium animals such as tree frogs, salamanders, baby snakes, and toads. In: Stein, Science Book, pp. 24-25
Toads, as pets in a large jar. In: Simon, Pets, pp. 48-52, 90-91

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Chemistry and curds -- curdling will likely result from boiling tomatoes with milk or cream; soda will neutralize acid from tomatoes. In: Brown, 666 Science Tricks & Expts., p. 324
How to ripen a tomato with an apple. In: Stein, Science Book, p. 221
Tomatoes. In: McPhee, Gardening, pp. [20-21]

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Basic tone generator using the 555 IC timer. Pop Elec, July '74, pp. 50-51
CMOS tone sequencer. Pop Elec, Nov. '79, pp. 117-118
Dual tone decoder IC. Pop Elec, Dec. '73, pp. 81-82
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Light-sensitive tone generator. Pop Elec, Dec. '81, p. 106
One-octave tone generator. Pop Elec, Sept. '74, p. 93
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Three-way tone generator from a code practice oscillator. In: Friedman, 99 Practical, pp. 56-57
Tone-burst generator using dual timer. Pop Elec, May '74, p. 83
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Mapping the tongue. Are certain areas of the tongue more sensitive to one taste than to another? In: Cobb, More Science Experiments, pp. 118-126
Taste experiments: mapping the tongue; what skins can taste. In: Stein, Science Book, pp. 213-215

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Physics of spinning tops, including some far-out ones. Sci Am, Mar. '81, pp. 182, 184, 187-188, 190, 192, 194
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Using a toy top or gyroscope to demonstrate dealing with some of the problems of space flight. In: Simon, How to Be a Space Scientist, pp. 22-23

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Topological game of sprouts, and brussels sprouts. In: Gardner, Mathematical Carnival, pp. 3-11
Various mathematical puzzles, including some topological problems and three Möbius strip puzzles. In: Cobb, Bet You Can't, pp. 67-82

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Bet you can't tell hot from cold - demonstration involving placing hands in bowls of water of different temperatures. In: Cobb, Bet You Can't, p. 101
Confusing the senses of heat and cold. In: Brown, 666 Science Tricks & Expts., pp. 102-103
Pin touch-tester. In: Herbert, Mr. Wizard's, p. 83
Sense of touch - experiment involving touching the points of pencils to various parts of the body. In: Brown, 666 Science Tricks & Expts., p. 100
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LED traffic light for model railroad and car layouts. Pop Elec, Dec. '79, pp. 51, 54-56
Stop-go traffic lights. In: Amery, KnowHow...Magnets, pp. 28-29
"Traffic light" electronic project -- LED's light up in different colors. In: Duncan, Adventures, pp. 44-47

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Transducer amplifier. In: Carr, 104 Weekend, pp. 222-227

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Experimenting with VMOS power transistors -- VMOS amplifier and analog switches. Computers & Electronics, Mar. '83, pp. 111-113
Field-electric transistor device for controlling input into two or more microphones feeding into a central location. In: Malcolm, How to Build Electronic Projects, pp. 110-112
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Build a low-cost transistor tester. Pop Elec, Mar. '79, pp. 67-68

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Build the low-cost transistor Osci-tester. Pop Elec, Mar. '74, pp. 64-65
Build the transistor identometer - identifies leads, indicates PNP or NPN polarity and shows up bad devices. Pop Elec, Jan. '75, pp. 69-71
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In-circuit/out-of-circuit semiconductor junction tester. Pop Elec, July '74, p. 58
R-F transistor tester. Pop Elec, Aug. '74, pp. 58-60
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Versatile, inexpensive semiconductor junction tester. Pop Elec, Feb. '73, p. 34, and comment, May '73, p. 8

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Grow a pine tree from the seeds from a pine cone. In: Brown, 666 Science Tricks & Expts., pp. 129-130
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Magic triangle - can be made to form a straight line. In: Shalit, Science, p. 29
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Light from the teeth -- electrical discharge can be seen in a dark room when a wintergreen Life Saver candy is crushed. In: Brown, 666 Science Tricks & Expts., pp. 91-92
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Planarians as pets in a jar. In: Simon, Pets, pp. 25-29, 90-91

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Construction of the Volz sun photometer - used to determine coefficient of atmospheric turbidity. In: Norton, Solar Energy, pp. 46-51
Interferometer to measure the dirt content of water. In: Light and Its Uses, pp. 82-85 (also in "Amateur Scientist" column, Sci Am, June '73)
Measuring atmospheric turbidity by means of a sun photometer, and demonstrating that small particles suspended in the atmosphere reduce visibility by increasing turbidity. In: Norton, Solar Energy, pp. 37-45
Measuring turbidity with a two-way Secchi disk. Sci Teach, May '76, p. 46

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Steam turbine, operated by a small solar furnace. In: Cherrier, Fascinating...Physics, pp. 40-42
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Diffraction of light by ultrasonic waves, using laser light. In: Kallard, Exploring, pp. 206-213
Listen to a new world of sounds with electronic ultrasonic detector -- apparatus converts ultrasonics to audible sounds. Pop Elec, July '78, pp. 64-66, and addition Dec. '78, p. 6

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Build a blacklight lantern. Pop Elec, Apr. '75, pp. 35-37

Unusual kind of gas laser puts out pulses in the ultraviolet. Sci Am, June '74, pp. 122-127, 136

VACUUM

See also THERMOS BOTTLES; VACUUM PUMPS; VACUUM TUBES

What is suction? Demonstration with two plungers. In: Nelson, Science, p. 28

VACUUM PUMPS

Poor teacher's hand vacuum pump -- a bicycle pump with simple modifications. Sci Teach, Feb. '77, pp. 36-37

VACUUM TUBES

See also CATHODE RAY TUBES; DIODES; GEIGER-MÜLLER COUNTERS; X-RAYS

Constructing a vacuum-tube demonstrator. In: Giant Handbook, pp. 86-92

VANES

See WEATHERVANES

VAPOR PRESSURE

See also VAPORIZATION, HEATS OF

Ether vapor water gun demonstrates high vapor pressure of liquid. Sci Teach, Apr. '76, p. 38

VAPORIZATION, HEATS OF

See also BOILING; CONDENSATION

Icy temperature -- demonstrations that when ice is melting or water boiling, temperature of the ice or water remains constant until the ice has melted or the water has boiled. In: Brown, 666 Science Tricks & Expts., p. 282

VECTOR ANALYSIS

"Go Vector": a physics game. Sci Teach, Mar. '74, pp. 42-43

VEGETABLES

See also names of specific vegetables, e.g., BEANS, BEETS, CABBAGE, CARROTS, POTATOES

Demonstrating dehydration of vegetables left exposed to air. In: Penrose, Dr. Zed's Brilliant, pp. 60-61

VEGETABLES (continued)
Herda, Vegetables in a Pot -- includes information on selection of containers, selection of seeds, preparing soil, planting, light, water, humidity and temperature, and suggested varieties of vegetables for growing
Indoor gardening project: using window boxes to grow vegetables and flowers. In: Millard, Plants for Kids, pp. 34-35, 37-49

VEHICLES
See, e.g., AUTOMOBILES; BOATS AND BOATING

VEINS (ANATOMY)
Observing valves in arm veins. In: Brown, 666 Science Tricks & Expts., p.118

VELOCITY
See SPEED

VENUS (PLANET)
Photographing planets. In: Mayall, Skyshooting, pp. 109-117

VERTIGO
See DIZZINESS

VIBRATION
See also, e.g., FREQUENCIES OF OSCILLATING SYSTEMS; LIGHT; LISSAJOUS' CURVES; RESONANCE; SOUND; SOUND WAVES; WAVES

Arrangement for measuring vibrations of a rotor axle or other test object with laser light. In: Kallard, Exploring, p. 42
Can we see sound vibrations? Demonstration with knitting needle, rubber band, etc. In: Nelson, Science, p. 95
Demonstration using a stroboscope shows how a tuning fork vibrates. Sci Teach, Apr. '74, p. 46, and comment Mar. '78, pp. 35-36
Experiments to study ways in which vibrations are transmitted. In: Rosenfeld, Science, pp. 27-31, 35, 166
How do vibrating wires make different sounds? In: Nelson, Science, p. 101
Michelson interferometer, using laser light, used for vibration analysis. In: Kallard, Exploring, pp. 144-145
Model seismometer - simple apparatus to detect vibrations and record them on a roll of paper. In: Rosenfeld, Science, pp. 27-28, 32-35, 166
Seeing sound vibrations. In: Goldstein-Jackson, Experiments, pp. 100-101
Some vibration demonstrations: sounding fork, spoon gong, spoon and string apparatus. In: Herbert, Mr. Wizard's, pp. 77-78
Sound and other vibrations - 26 groups of experiments on various aspects of vibration. In: Brown, 666 Science Tricks & Expts., pp. 15-37
Vibration amplifier. In: Penrose, Dr. Zed's Dazzling, pp. 36-37
Vibration detection and examining vibrating objects using laser speckle. In: Kallard, Exploring, p. 167-169
Vibration detector. In: Brown, 666 Science Tricks & Expts., p. 38

VIDEO TAPE RECORDERS AND RECORDING
Synthesizer produces stereo sound from mono output of any TV receiver or VCR. Pop Elec, June '82, pp. 55-59

VINEGAR
Analysis of weak acids by titration, including determination of potassium hydrogen phthalate in an impure sample and analysis of vinegar for its acid content. In: Skoog, Fundamentals, pp. 731-732
Chlorine breaks up water molecules and liberates oxygen; oxidizing action of sodium hypochlorite solution is speeded up by a small amount of vinegar (acid). In: Morgan, First Chemistry Book, pp. 153-154
Make a salt from vinegar and baking soda. In: Brown, 666 Science Tricks & Expts., p. 354
Make ink using steel wool, vinegar, and tea. In: Brown, 666 Science Tricks & Expts., pp. 347-348
Pushing an egg into a bottle without damaging the shell by first soaking the egg in vinegar. In: Goldstein-Jackson, Experiments, pp. 138-139

VISCOSITY
Serious fun with Polyox, Silly Putty, Slime, and other non-Newtonian fluids; making quicksand, shear-thickening fluid from water and cornstarch, etc. Sci Am, Nov. '78, pp. 186, 188, 191-194, 196, 198, and additional comments Feb. '80, p. 170
Viscometer and its use. In: Giant Handbook, pp. 231-233

VISION
See also EYE; OPTICAL ILLUSIONS

About phosphenes: luminous patterns that appear when the eyes are closed. Sci Am, May '81, pp. 174, 176, 178, 180, 183-184, 186, and comments Dec. '81, pp. 176, 178
After effect of looking at a bare electric light bulb for 10 seconds. In: Brown, 666 Science Tricks & Expts., p. 99
Afterimage, an eye trick. In: Brown, 666 Science Tricks & Expts., pp. 135-136
Are there blind spots in our eyes? In: Nelson, Science, p. 294
Bet you can't make two pencil points meet on one try - experiment using only one eye. In: Cobb, Bet You Can't, p. 103
Demonstration of after-image of the eye. In: Baldini, Student Science Activities, pp. 132-133
Demonstration of the blind spot in the eye. In: Shalit, Science, p. 106
Demonstrations involving vision. In: Brown, 666 Science Tricks & Expts., pp. 293-294, 303-305
The devil in reverse [afterimages]. In: Lanners, Secrets, pp. 139-140
Do our eyes get tired? Demonstration involving staring at a colored spot and determining the effect on vision. In: Nelson, Science, p. 293
Each eye sees a separate image - demonstration with two pencils. In: Baldini, Student Science Activities, p. 132
Experiment for testing eye resolution. Sci Teach, Dec. '81, pp. 20-21
Experiments concerning stimuli giving rise to color vision. Sci Am, June '79, pp. 188-192, 194, 202
Eye games - demonstrating stereoscopic vision. In: Brown, 666 Science Tricks & Expts., p. 137
The fade-over effect ["irradiation"]. In: Lanners, Secrets, pp. 140-141
Finding the blind spot in your eye. In: Baldini, Student Science Activities, pp. 131-132
"Floaters": visual artifacts that result from blood cells in front of the retina. Sci Am, Apr. '82, pp. 150-151, 155-156, 158, 162
How do our eyes blend separate colors? How to prepare a color disc. In: Nelson, Science, p. 291
How do we see motion? Simple demonstration with a spinning card. In: Nelson, Science, p. 295

VISION (continued)
How to see a "hole" in your hand using a cardboard tube. In: Herbert, Mr. Wizard's, p. 74
Interpretation of visual illusions, and including diagrams of several illusions. Sci Am, Dec. '83, pp. 154, 156-157, 159-162, 178
Optical illusions with the help of a ruler. In: Lanners, Secrets, p. 145
Right- or left-sighted? In: Lanners, Secrets, pp. 121-124
"Seeing aid for the blind" -- circuit which provides an audible signal of pitch which changes with different light levels. Pop Elec, June '75, pp. 65-66
Similarity between a convex lens and the eye. In: Baldini, Student Science Activities, pp. 128-129
Simulating spectral colors with a specially marked rotating disc. In: Lanners, Secrets, pp. 126-127
Trick of vision -- looking through a hole in your hand. In: Shalit, Science, pp. 104-105
Two tricks of the eye. In: Brown, 666 Science Tricks & Expts., pp. 141-142
Visual illusions that can be achieved by putting a dark filter over one eye; Pulfrich pendulum illusion and other visual latency experiment discussions. Sci Am, Mar. '78, pp. 142-143, 146, 148-154, and addition July '81, pp. 186-187
Whirling wonder discs. In: Wels, Science, pp. 2-7

VISION - TESTING
How well do we see? Demonstration using Snellen Chart, Astigmatic Test Chart, and Color-Blind Chart. In: Nelson, Science, p. 290
Making an eye chart. In: Baldini, Student Science Activities, pp. 130-131
Method and procedure for eye testing with laser speckle. In: Kallard, Exploring, pp. 165-166

VITAMIN C
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VITAMIN E
Vitamin E as an antioxidant. In: Cobb, More Science Experiments, pp. 72-74

VITAMINS
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What are good sources of vitamins and minerals? In: Nelson, Science, pp. 307-308

VIVARIUMS
See also AQUARIUMS; GARDENS; HERBARIUMS; TERRARIUMS

Making and maintaining a simple vivarium. In: Nelson, Science, p. 241

VOICE
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Artificial larynx. In: Mendelson, 103 Simple, p. 114
Build a vocal "truth" analyzer. Pop Elec, Apr. '80, pp. 66, 68-71, and correction Jan. '81, p. 12
Voice-controlled train. In: Giant Handbook, pp. 319-321
Voice scrambler. Pop Elec, Sept. '74, pp. 56-61, and comment Jan. '75, p.6
Voiceprints of birdsongs. Sci Am, Feb. '74, pp. 110-112, 124

VOLCANOES

Bottle volcano -- warm water rises into upper bottle of cold water. In: Amery, KnowHow...Experiments, p. 24

Carbon volcano. In: Brown, 666 Science Tricks & Expts., p. 363

Demonstrating volcanic action by constructing a plaster of Paris model and using ignited ammonium dichromate as the lava representation. In: Nelson, Science, p. 161

Experiments with water -- mixing of hot and cold water, making a demonstration volcano using hot and cold water, etc. In: Richards, Science Magic, p. 15

The forbidden planet -- model volcanoes in which sulphur and charcoal burn and copper sulphate and sodium chloride color the flames. In: Cherrier, Fascinating...Chemistry, pp. 65-67

Making a mini-volcano using vinegar and baking soda. In: Penrose, Dr. Zed's Dazzling, pp. 26-27

Model volcano in which the eruption is caused by the combustion of a zinc-sulphur mixture. In: Cherrier, Fascinating...Chemistry, pp. 63-64

Model volcano in which lava is detergent bubbles containing carbon dioxide. In: Cherrier, Fascinating...Chemistry, p. 65

The tiltmeter: 'earth-shaking' device for simulating volcanism. Sci Teach, Mar. '81, pp. 42-43, and correction and comments May '81, p. 21

Underwater volcano created by water pressure difference. In: Richards, Science Magic, p. 27

Volcanology by courier: science in stamps. Sci Teach, Mar. '81, pp. 30-34, and correction Oct. '81, p. 22

What causes a volcano to erupt? Demonstration involving making a volcano model from a flour paste and using puffed rice cereal as the eruptive material. In: Nelson, Science, p. 160

VOLHARD METHOD

See VOLUMETRIC ANALYSIS (CHEMISTRY)

VOLTAGE

Auto voltage adapter for transistor radios. In: Friedman, 99 Practical, pp. 26-27

Build a transformerless dc-to-dc voltage doubler. Pop Elec, Sept. '77, pp. 55-56

dc low-voltage monitoring circuit. Pop Elec, Sept. '77, p. 92

Line-voltage compensator - boosts power-supply voltage when it drops too low. Pop Elec, May '79, p. 75

Line voltage monitor. In: Carr, 104 Weekend, pp. 70-71

Measuring breakdown voltage of insulation and capacitor dielectric materials, and building a tester. In: Giant Handbook, pp. 471-482

Miniature dc-dc voltage upconverters. Pop Elec, Oct. '78, p. 84

110-volt handy tester determines whether your 110-V ac outlet is working. In: Malcolm, How to Build Electronic Projects, pp. 92-94

12-VDC-to-117-VAC inverter, especially useful in autos and small boats. In: Mendelson, 103 Simple, p. 111

Voltage doubler. In: Friedman, 99 Practical, pp. 80-81

Voltage multiplier. Pop Elec, June '78, pp. 98-99

Voltage tripler, providing dc output approximately 3 times the applied ac voltage. In: Friedman, 99 Practical, pp. 81-82

VOLTAGE REGULATORS

Add-on overvoltage protection module. In: Carr, 104 Weekend, pp. 220-221

Build an automatic line voltage regulator. Pop Elec, Mar. '81, pp. 85-86

Build an electronic voltage regulator for your car. Pop Elec, July '78, pp. 55-58, and correction Oct. '78, p. 8

Controller for high voltage transients for microcomputers. In: Carr, 104 Weekend, pp. 221-222

Design your own voltage regulator which uses a zener diode. Pop Elec, Apr. '73, p. 76

The ferroresonant ac voltage regulator. Pop Elec, July '80, pp. 75-78

IC voltage regulators. Pop Elec, Oct. '77, pp. 88-89, and correction Jan. '78, p. 6

9-volt, 7.5-volt, or 6-volt regulator. Pop Elec, Dec. '73, p. 22

Overvoltage circuit - guard components from overload damage. Computers & Electronics, June '83, pp. 39-40, 46-47

Power guard -- boosts voltage and eliminates TV picture shrinkage during summer brownouts. Pop Elec, July '75, pp. 34-35

Simple regulator - unregulated input of from 6 to 20 volts will be transformed to regulated output. In: Mendelson, 103 Simple, p. 31

Voltage regulation circuits - voltage polarity converter, and negative and positive voltage multiplication. Pop Elec, Sept. '80, pp. 114-116

Voltage regulator, shunt type (regulation 0.5%). In: Mendelson, 103 Simple, p. 87

Zener regulator. In: Friedman, 99 Practical, pp. 77-78

VOLTAIC CELL

See ELECTRIC BATTERIES

VOLTAMETER

How to make a bleach (sodium hypochlorite solution) in a voltameter by electrolyzing a sodium chloride solution. In: Cherrier, Fascinating... Chemistry, p. 88

Voltameter apparatus produces chlorine and hydrogen from sodium chloride solution, and can be constructed to make explosive soap bubbles. In: Cherrier, Fascinating...Chemistry, pp. 86-87

VOLTMETER

AC voltmeter that is a sensitive troubleshooting meter. Pop Elec, May '76, pp. 41-43

Active rf voltmeter probe. In: Carr, 104 Weekend, pp. 72-73

Auto polarity, auto zero digital multimeter. Pop Elec, Dec. '74, pp. 33-37, and correction Mar. '75, p. 6

Build a true RMS voltmeter. Pop Elec, Apr. '79, pp. 35+

Build the minivolter which can also be used as an ohmmeter and an ammeter. Pop Elec, Apr. '75, pp. 46-47

Electric circuit for measuring the ratio of the average and rms values of a $\sin \omega t$ function. Sci Teach, Dec. '83, p. 53

Extinction-type neon voltmeter and continuity checker, using a printed circuit. In: Giant Handbook, pp. 262-266

High-frequency voltmeter. Pop Elec, Jan. '76, pp. 46-47

Line-voltage indicator circuit and pulser circuit. Pop Elec, Feb. '74, pp. 103-104

Low-cost millivolter, measures between 1mV and 1V full scale, and can be used as an AC voltmeter. Pop Elec, Mar. '73, pp. 44-45

Low-range voltmeter and its use. In: Giant Handbook, pp. 436-439

Meter measures AC, DC, and DC reverse voltages. In: Giant Handbook, pp. 446-449

VOLTMETER (continued)
Multiple test-point monitor; measures volts at a number of circuit points simultaneously. Computers & Electronics, Sept. '83, pp. 77-79
Neon tester and its use -- tester can be used for voltage measurements of up to 250V. In: Giant Handbook, pp. 408-409
Null voltmeter. In: Carr, 104 Weekend, pp. 29-34
Passive rf voltmeter probe. In: Carr, 104 Weekend, pp. 71-72
RF probe for VOM's - relative measures of rf voltages up to 200 MHz. In: Friedman, 99 Practical, p. 93
RF probe for VTVM's - measure rf voltage up to 200 MHz. In: Friedman, 99 Practical, p. 94
Radio frequency voltmeter. In: Carr, 104 Weekend, pp. 74-76
Simplified combination tester and its use - can be voltmeter or neon test light. In: Giant Handbook, pp. 427-428
Voltage indicator using LED's - indicates dc voltage polarity, reveals presence of ac voltage, and gives rough estimate of ac and dc voltage levels. Pop Elec, Apr. '74, p. 71
Voltage-sensitive switch (used with normally open relay) - relay energizes when voltage level exceeds a predetermined value; circuit usable with 100 volts or less input. In: Mendelson, 103 Simple, p. 122
Voltmeter calibrator. In: Carr, 104 Weekend, pp. 157-159

VOLUME (CUBIC CONTENT)
Bet you can't mix one quart and one quart and get two quarts - mixing rubbing alcohol and water. In: Cobb, Bet You Can't, p. 60
Demonstration to show that given volumes of water and rubbing alcohol when mixed will give a smaller total volume. In: Brown, 666 Science Tricks & Expts., pp. 336-337
A dissolving trick - salt occupies less volume in solution than when dry. In: Brown, 666 Science Tricks & Expts., p. 331
How can we measure the volume of irregularly shaped objects? In: Nelson, Science, p. 60

VOLUMETRIC ANALYSIS (CHEMISTRY)
See also, e.g., COULOMETRY (CHEMISTRY); GRAVIMETRIC ANALYSIS (CHEMISTRY); INDICATORS AND TEST PAPERS; POTENTIOMETRY (CHEMISTRY); and other specific chemical analytical methods

Analysis by titration of carbonate and carbonate mixtures. In: Skoog, Fundamentals, pp. 247-249 and 733-734
Analysis of weak acids by titration, including determination of potassium hydrogen phthalate in an impure sample and analysis of vinegar for its acid content. In: Skoog, Fundamentals, pp. 731-732
Determination of ammonium ion by titration. In: Skoog, Fundamentals, pp. 244-247 and 734-735
Determination of antimony in stibnite using iodine solution titration. In: Skoog, Fundamentals, pp. 362, 747-748
Determination of calcium by oxalate precipitation followed by titration; includes procedures for analysis of calcium in impure calcium carbonate and determination of calcium in limestone. In: Skoog, Fundamentals, pp. 345-346 and 743-744
Determination of iodine and iodide in a mixture by iodate titration. In: Skoog, Fundamentals, pp. 353-354 and 751 and other pages referred to in experimental instructions
Determination of iron in an ore using a dichromate titration. In: Skoog, Fundamentals, p. 746 and earlier material referred to
Determination of iron in an ore using cerium(IV) titration. In: Skoog, Fundamentals, pp. 745-746 and other pages of text referred to in instructions

VOLUMETRIC ANALYSIS (CHEMISTRY) (continued)

Determination of iron in an ore using Zimmermann-Reinhardt reagent titration. In: Skoog, Fundamentals, pp. 741-743

Determination of phenol by bromine substitution. In: Skoog, Fundamentals, pp. 752-753 and also pp. 350-353 and other pages referred to in experimental instructions.

Iodimetric and iodometric methods of analysis, including specific experimental determinations. In: Skoog, Fundamentals, pp. 747-753 and chapter 16

Iodometric method to quantitatively determine copper in ore and brass. In: Skoog, Fundamentals, pp. 366-369 and 749-751

Kjeldahl analysis for organic amine nitrogen - procedure suitable for analysis of protein. In: Skoog, Fundamentals, pp. 244-246 and 734-735

Neutralization and potentiometric titration analysis of amines and amino acids in glacial acetic acid as solvent. In: Skoog, Fundamentals, pp. 263-266, 735-737, and 756

Preparation and standardization of cerium(IV) solutions for quantitative chemical analysis. In: Skoog, Fundamentals, pp. 346-349 and 744-745

Preparation and standardization of dichromate solutions for titration analysis. In: Skoog, Fundamentals, pp. 349-350 and 746

Preparation and standardization of iodine solutions for titration analyses. In: Skoog, Fundamentals, p. 747

Preparation and standardization of permanganate solutions. In: Skoog, Fundamentals, pp. 339-346 and 740-741

Preparation and standardization of reagents for neutralization titrations. In: Skoog, Fundamentals, pp. 729-731 and also chapters 9, 10, and 11, as indicated

Preparation and standardization of sodium thiosulfate solutions. In: Skoog, Fundamentals, pp. 363-365 and 748-749

Preparation and use of a Jones reductor in connection with oxidation-reduction titrations. In: Skoog, Fundamentals, pp. 739-740

Quantitative analysis for glycerol using periodate oxidation method. In: Skoog, Fundamentals, pp. 354-357 and 751-752

Silver nitrate and its solutions; preparation of standard 0.1-F silver nitrate for volumetric analysis. In: Skoog, Fundamentals, p. 726

Titration analysis based on chelate formation - preparation and standardization of EDTA solutions, and determination of calcium and magnesium (including calcium and magnesium in hard water) by this method. In: Skoog, Fundamentals, pp. 737-739 and chapter 13

Volumetric determination of chloride by the Fajans method. In: Skoog, Fundamentals, p. 728

Volumetric determination of chloride by the Mohr method. In: Skoog, Fundamentals, pp. 179 and 726

Volumetric determination of chloride by the Volhard method. In: Skoog, Fundamentals, pp. 180 and 727-728

VORTEX MOTION

Vortices of air, fire, and water -- how to construct apparatus and how to simulate tornados, whirlpools and fire whirls. In: Schaefer, A Field Guide, pp. 302-305

Wonders of physics that can be found in a cup of coffee or tea -- fluid dynamics, electrostatics, pitch of sound, cooling. Sci Am, Nov. '77, pp. 152, 154-158, 160, 164

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WALKING STICK (INSECT)
The walking stick. In: Headstrom, Your Insect Pet, pp. 81-83, 144

WASHING SODA
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Braconid wasps -- classification, life cycle, how to find cocoons, what you can observe. In: Stokes, Guide, pp. 352-356
Hornets and yellow jackets -- classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 262-267
Ichneumon wasps -- classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 74-79
Paper wasps -- classification, life cycle, how to find, what you can observe. In: Stokes, Guide, pp. 88-93 and 268-271

WASTE, DISPOSAL OF
See REFUSE AND REFUSE DISPOSAL

WATCHES
See CLOCKS AND WATCHES

WATER
See also, e.g., FOG; FROST; ICE; MINERAL WATERS; MOISTURE; RAIN AND RAINFALL; SNOW; STEAM; WATER PRESSURE

Bet you can't mix one quart and one quart and get two quarts -- mixing rubbing alcohol and water. In: Cobb, Bet You Can't, p. 60
Boiling water in a paper pot. In: Richards, Science Magic, p. 47
Combustion started by water, using several different mixtures of chemical compounds. In: Chen, Entertaining, pp. 49-50
Demonstration to show that given volumes of water and rubbing alcohol when mixed will give a smaller total volume. In: Brown, 666 Science Tricks & Expts., pp. 336-337
Demonstration with water and glycerol -- this curious demonstration suggests important concepts of viscous fluid flow, liquid diffusion and the nature of reversible reactions. Sci Teach, Jan. '73, p. 42
Does water have magnifying and refractive qualities? Demonstration involves observation of the appearance of a spoon in a tumbler of water. In: Nelson, Science, p. 85
Drops of water dance on a hot skillet; small pieces of heated metal dance on water; experimenter walks on hot coals - Leidenfrost effect. Sci Am, Aug. '77, pp. 126-131, 140
Experiments with water involving capillary action. In: Richards, Science Magic, p. 28
Experiments with water -- mixing of hot and cold water, making a demonstration volcano using hot and cold water, etc. In: Richards, Science Magic, p. 15
Franklin boiling; or how to boil water with cold water. In: Cherrier, Fascinating...Physics, pp. 22-23
Freezing of water and paraffin -- expansion or contraction? In: Brown, 666 Science Tricks & Expts., p. 289
Hard and soft waters; action of soap in hard and in soft water. In: Morgan, First Chemistry Book, pp. 64-67
Hot water freezes faster than cold water; experiments on freezing water. Sci Am, Sept. '77, pp. 246, 248, 250, 252, 257, 262

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How cold does ice get? Demonstration showing the effect of salt on the freezing point of water. In: Nelson, Science, p. 53

How does air pressure affect boiling water? In: Nelson, Science, p. 39

How to soften permanent hard water. In: Morgan, First Chemistry Book, pp. 67-69

Icy temperature -- demonstrations that when ice is melting or water boiling, temperature of the ice or water remains constant until the ice has melted or the water has boiled. In: Brown, 666 Science Tricks & Expts., p. 282

Inexpensive device allows illustration of the effect of increasing pressure on the boiling point of water. Sci Teach, Feb. '81, p. 41

Making a column of ice -- a demonstration that shows that water expands on freezing. In: Goldstein-Jackson, Experiments, pp. 36-37

Making water beads in a hot frying pan, and why the process works. In: Herbert, Mr. Wizard's, p. 62

Making water wetter -- a surface tension effect. In: Goldstein-Jackson, Experiments, pp. 118-119

Mystery ice - demonstration with a bottle of soft drink; also demonstration of the expansion of water on freezing. In: Brown, 666 Science Tricks & Expts., pp. 274-275

Old freezing question -- in what order do boiled water, aerated water, and salt water freeze. In: Brown, 666 Science Tricks & Expts., pp. 275-276

Several experiments to determine whether pure water and water with a variety of dissolved substances are good electrical conductors. Instructions on building homemade testing apparatus. In: Morgan, Adventures in Electrochemistry, pp. 43-52

Soap and detergents make water wetter. In: Morgan, First Chemistry Book, pp. 163-168

Water droplets can be made to dance in a hot pan -- steam holds them up briefly. In: Brown, 666 Science Tricks & Expts., pp. 283-284

Water droplets that float on water. Sci Am, Aug. '73, pp. 104-109, 116

Water forms solutions with many substances; soluble or insoluble in water? In: Morgan, First Chemistry Book, pp. 26-28

Water is a part of some crystal structures -- experiment using washing soda to demonstrate water of hydration. Also a discussion of plaster of Paris. In: Morgan, First Chemistry Book, pp. 46-50

Water is often used to bring about chemical action -- demonstration of chemical activity of baking powder when placed in water. In: Morgan, First Chemistry Book, pp. 52-53

Water-level indicator is an electronic circuit employing transistors. In: Malcolm, How to Build Electronic Projects, pp. 102-104

Water's invisible skin. In: Richards, Science Magic, p. 24

What happens when water boils is a lot more complicated than you might think. Sci Am, Dec. '82, pp. 162, 166, 168, 170-171, 178

When a candle burns; a candle is a miniature gas factory; the gas in a candle flame; the carbon and the water in a candle flame. In: Morgan, First Chemistry Book, pp. 75-80

When water freezes does it expand or contract? In: Nelson, Science, p. 55

Which is the best solvent, hot water or cold water? In: Morgan, First Chemistry Book, pp. 34-36

WATER - ANALYSIS

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Determination of iron in water by spectrophotometry. In: Skoog, Fundamentals, pp. 761-763 and other pages as indicated in the text

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WATER - ANALYSIS (continued)

Determination of sodium, potassium, and calcium in mineral waters. In: Skoog, Fundamentals, p. 765 and chapter 25

How can the amateur detect metals in air, liquids or solids? Sci Am, Feb. '81, pp. 168-170, 173-176

Interferometer to measure dirt content of water. In: Light and Its Uses, pp. 82-85 (also in"Amateur Scientist" column, Sci Am, June '73)

Measuring the concentration of colloidal solutions or the dirt content of water using laser light. In: Kallard, Exploring, pp. 85-87

Potentiometric determination of the pH of water. In: Skoog, Fundamentals, pp. 753-754

Titration analysis based on chelate formation -- preparation and standardization of EDTA solutions, and determination of calcium and magnesium (including calcium and magnesium in hard water) by this method. In: Skoog, Fundamentals, pp. 737-739 and chapter 13

WATER - DENSITY

Water density. Sci Teach, Jan. '80, p. 38

Which is heavier - water or wine? In: Lanners, Secrets, pp. 54-55

WATER - ELECTROLYSIS

Electrolysis of water. In: Graf, Safe and Simple, pp. 83-84

Electrolysis of water. Sci Teach, Sept. '75, p. 31

Electrolysis of water produces oxygen and hydrogen gas. In: Morgan, Adventures in Electrochemistry, pp. 188-195

Electrolytic cell for producing larger quantities of oxygen and hydrogen. In: Morgan, Adventures in Electrochemistry, pp. 204-208

How to prove that the bubbles in the electrolysis of water are oxygen and hydrogen. In: Morgan, First Chemistry Book, pp. 57-64

You can separate water into oxygen and hydrogen in your home laboratory. In: Morgan, First Chemistry Book, pp. 53-57

WATER - POLLUTION

See also WATER - ANALYSIS

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